ANNUAL REPORT 2008

FACULTY OF ELECTRICAL ENGINEERING
AND COMMUNICATION
BRNO UNIVERSITY OF TECHNOLOGY

Contents

Introduction

History

Brno University of Technology (BUT) is the second largest and the second oldest technical university in the Czech Republic. It was founded in 1849 for technical, agricultural and commercial specializations. The languages of tuition were Czech and German. In consequence of political and national disputes Czech gradually ceased to be used as a language of tuition until in 1899 the Czech Technical High School was established in Brno. After World War I and the founding of Czechoslovakia this school merged with the German Technical School (originally bilingual) to form the High Technical School in Brno (later bearing the name of Dr. Edvard Beneš, the second President of Czechoslovakia). In the period between World War I and World War II the school was among the best technical high schools in Europe. During World War II the school was, as all other Czech high schools were, closed and the premises were used by German military institutions, and most equipment was destroyed. Immediately after the end of World War II the activities of the school were resumed. In 1951, at the beginning of Cold War, the Technical High School was closed and some departments became parts of the newly established Military Academy. Tuition for civilians continued at the former Faculty of Civil Engineering only. Electrotechnical disciplines were first taught at the university in 1905. Since the Faculty of Power Engineering was founded, 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). Organizational and economic activities concerned with the founding of FIT and transformation of FEECS were crowned by the decision of the Rector of BUT to appoint Prof. Radimír Vrba Acting Dean of FEEC and Prof. Tomáš Hruška Acting Dean of FIT as of 1 January 2002. The Faculty of Electrical Engineering and Communication came to being on 1 January 2002.

Faculty in 2008

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 2008, 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 2008, there were 234 teachers and 4,973 students in all forms of state-supported programmes. Moreover, education was provided to 324 students of the Faculty of Information Technology, 25 students of the Faculty of Mechanical Engineering and 190 students of the Faculty of Management. On the other hand, the Faculty purchased tuition for 19 students from the Faculty of Management, for 29 students from the Faculty of Information Technology and for 13 students from the Centre of Consultancy and Education. As a result, the total

number of students taught at the faculty is 4,452. Education was provided in the programme Electrical Engineering, Electronics, Communication and Control Technology (EECR) accredited in 2001 in accordance with the Bologna Declaration and the programme Biomedical Technology and Bioinformatics (BTBIO-A) accredited in 2007. The study programmes at FEEC are now fully compatible with 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 2008 were 631 students who completed their studies in the Bachelor degree programme, 474 Master degree graduates, and 41 postgraduates completed their doctoral studies. There were 1,262 students coming to the Faculty, 640 students entered the first year of the follow-up Master programme, and 89 graduates entered the doctoral programme. Tuition in English was provided to 10 international students paying their fees. Seven 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 and the Rector of Brno University of Technology in memoriam of Prof. Jiří Brauner, one of the first deans of the Faculty of Electrical Engineering
- opening of the second year of the new Bachelor degree programme BTBIO-A Biomedical Technology and Bioinformatics
- preparing of new and innovated electronic texts in Czech and in 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 Department of Mathematics
- Open Door Days (December 2008, January 2009), visits by students and teachers to secondary schools
- presentation of new study programmes at FEEC BUT at the trade fair of higher education and lifelong education GAUDEAMUS 2008, 21 – 24 October 2008, to promote FEEC and arise interest of secondary school students in study at FEEC
- meeting of the leaderships of the Czech and Slovak faculties of electrical engineering and associated faculties in Luhačovice, 13-15 May 2008
- publication of the faculty yearbook 2007/2008
- development of education leading to habilitations and procedures to professorship
- The STUDENT EEICT 2008 Conference and Competition organized in cooperation with the Faculty of Information Technology and sponsored by the companies ABB, TYCO, HONEYWELL and other, with 62 Bachelor papers, 82 Master papers, 94 doctoral papers and 10 papers of secondary-school students
- work on Longlife Learning Programme-Erasmus and on other European programmes
- transfer of the faculty information system and faculty websites to IS Apollo
- activities focused on construction of new premises in campus Pod Palackého vrchem - Technická 10 and Technická 12
- continuation of the three research plans commenced in 2005 (scheduled 2005-2009 or 2011), chief investigators Prof. Jiří Kazelle, Prof. Jiří Svačina and Prof. Radimír Vrba and another research plan commenced in 2007, chief coordinator 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 members of Academic Senate, particularly the chairs Vlasta Krupková and Miloslav Steinbauer focused on the organizational and economic aspects of the development of FEEC
- activities of Advisor for Equal Opportunities Naděžda Uhdeová supported by the Development Programme of the Ministry of Education focused on the analysis of the causes of the very low interest of girls in studies at FEEC, consultancy for female students, and study opportunities for handicapped students at FEEC
- recruitment and care of foreign 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 41st faculty ball at the International hotel

Achievements

In 2008, 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 research plans and activities of four research centres.

All staff members and postgraduate students of FEEC 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 Research and Doctoral Degree Programme

Prof. Ing. Ivo Provazník, Ph.D.
Vice-Dean for External Relations and International Affairs

Chairman of Academic Senate

RNDr. Vlasta Krupková, CSc. (until 24 October 2008)
Ing. Miloslav Steinbauer, Ph.D. (since 24 October 2008)

Faculty Secretary

Ing. Miloslav Morda

Student Advisor to the Dean

Jan Dolenský

Advisor for Equal Opportunities

RNDr. Naděžda Uhdeová, Ph.D.

Trade Unions Representative

Prof. Ing. Vítězslav Hájek, CSc.

Departments

Department of Biomedical Engineering
Department of Control and Instrumentation
Department of Electrical 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. Jarmila Dědková, CSc.
Doc. 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, Ph.D.
Prof. Ing. Zdeněk Smékal, CSc.
Prof. Ing. Jiří Svačina, CSc.
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
- 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
- Communications and Informatics
- Cybernetics, Control and Measurement
- Electronics and Wireless Communication
- Electrotechnical Manufacturing and Management
- Microelectronics
- Power Electrical and Electronic Engineering
- Power Electrical Engineering

Doctoral Degree Programme Electrical, Electronic, Communication and Control Technology
Study areas:

- Biomedical Electronics and Biocybernetics
- Cybernetics, Control and Measurement
- Electronics and Wireless Communication
- 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
- Cybernetics, Control and Measurement
- Electronics and Communications
- Mathematics in Electrical Engineering
- Microelectronics and Technology
- Physical Electronics and Nanotechnology
- Power Electrical and Electronic Engineering
- Teleinformatics
- Theoretical Electrical Engineering

Accredited Areas for Habilitation Procedures and Procedures for Appointment to Professorship

- Biomedical Engineering
- Electrical and Electronic Technology
- Electronics and Communications
- 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 was launched (BTBIO-A). The full-time format of study covers the study area Biomedical Technology and Bioinformatics (A-BTB) is offered. Taking part in tuition in this interdisciplinary programme is the Medical Faculty of Masaryk University in Brno.

The Bachelor programme 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, 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 rules for use of medical technology and medical informatics including ability to communicate with them. They are also offered information on legislative and learn how to apply it in practice. Emphasis is laid on general and professional language skills.

Included in the programme is four-week professional training in hospitals, health centres, companies focused on medical treatment, research, production and sales 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 study in the Bachelor programme.

The highest possible number of students approved by Academic Senate for admission in 2008/09 was 120. The admission procedure took place on 3 June 2008. The written examination contained tests in mathematics and biology. Applicants who took their school-leaving examination in biology or mathematics with grades 1 or 2 and achieved an average of 2 or higher were exempt from the examination. Applicants who completed the preparatory course in mathematics organized by FEEC with grade 1 or 2 and at the same time achieved an average of 2 at the school-leaving examination were also exempt from the examination.

The maximum number of points to be achieved in each subject was 50 and the pass was 12 points achieved in each subject. All applicants who passed the entrance examination and all those who were exempt from the examination were admitted to study at FEEC.
In 2008, there were 203 paid applications for study in the programme BTBIO-A, 141 applicants were admitted and 111 registered for study at FEEC. There were 160 students in the programme BTBIO-A in 2008.

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 2002/2003, and in part-time format of study since 2004/2005.

In 2008, 1960 full-time students enrolled in the Bachelor programme EECR-B. Studies were successfully completed by 569 students, 88 of them in Automation and Measurement (B-AMT), 175 in Electronics and Communications (B-EST), 79 in Microelectronics and Technology (B-MET), 61 in Power Electrical and Electronic Engineering (B-SEE) and 166 in Teleinformatics (B-TLI).

In the part-time Bachelor programme EECR-BK there were 283 students in 2008 - 122 in the first year, 68 in the second year and 93 in the third year. Part-time study was completed by 59 stu-

dents, 14 in the study area Automation and Measurement (BK-AMT), 11 in Electronics and Communications (BK-EST), 9 in Power Electrical and Electronic Engineering (BK-SEE) and 25 in Teleinformatics (BK-TLI).

Admission procedure is a priority of the Faculty. It took place on 3 June 2008. Applications for both 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 basis of informatics. Students who had passed their school-leaving exam in physics or mathematics with A or B evaluation and at the same time achieved the study average of 2,0 at the most were exempt from the entrance examination. Students who had attended the preparatory course on physics or mathematics and their final evaluation was A or B plus the maximum average of 2,0 also did not have to take the entrance examination. The maximum number of points in each subject was 50. The minimum number needed was 12 in each subject. All applicants who passed the entrance examination or were exempt from this examination were enrolled for the study at the Faculty of Electrical Engineering and Communication. A place at FEEC was also offered to applicants for study at FIT who had not been admitted for capacity reasons. In 2008, there were 1,627 applicants for study at FEEC, 1,295 for full-time study and 332 for part-time study. Out of them, 912 students were admitted in full-time study and 209 in part-time study. Finally, 751 students enrolled in full-time study and 193 students in part-time study. Long-term admission statistics show increasing numbers of applicants interested in the part-time study format.

Graph 1 shows numbers of applicants, admitted and enrolled full-time students since 2003. The decreasing numbers of applicants are due to the considerably lower demographic figures and the interest of students in newly accredited bachelor study programmes at other universities. Interest of applicants in study areas is recorded at the end of the first semester after presentations of study areas. Statistics from academic years 2004/05 to 2008/09 are in Table 1.

The level of incoming students has been monitored for several years. An important factor is the percentage of applicants 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.

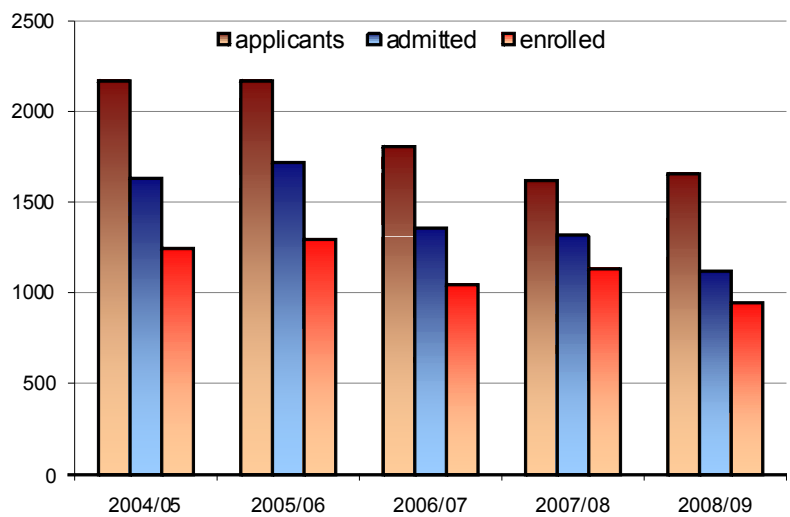
Another indicator is the percentage of applicants coming from certain types of secondary schools – gymnasium-type secondary schools (G), technical secondary schools (SPŠ) and technical training centres (SOU) who were enrolled in the Bachelor programme EECR-B. See Graph 3. The graph shows that the numbers of applicants coming from technical training centres has decreased in favour of students coming from gymnasium-type secondary schools.

Preparatory courses in mathematics and physics were offered by the Departments of Mathematics and Physics to assist applicants preparing for entrance examinations, and to help them adapt to study at university. In 2008 the course in mathematics was attended by 140 students and the course in physics was completed by 25 students.

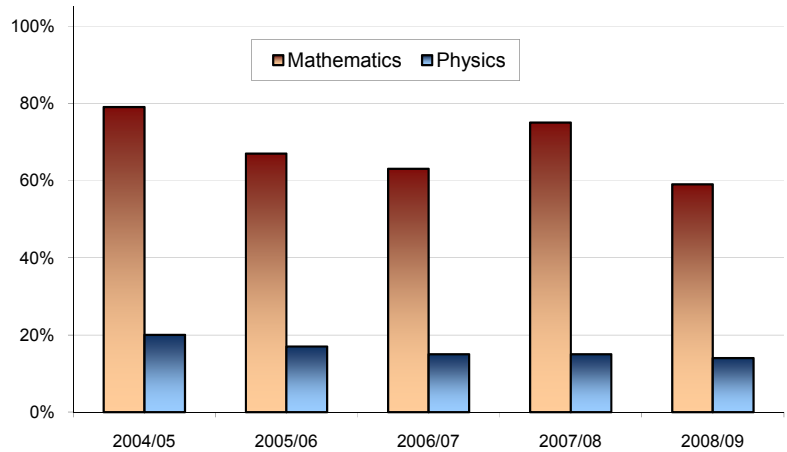
All formats of study and qualifications such as Certificate of Electrotechnical Qualification, Certificate of Pedagogical Practice, Microsoft Certificate, Cisco Certificate are presented in the media. In order to promote the study programmes offered at FEEC and increase the number of secondary-school students interested in them Open Door Days were organized, students and teachers visited secondary schools, and FEEC participated in the 15th GAUDEAMUS fair.

Table1: Interest of full-time students in study areas in the Bachelor degree programme – Automation and Measurement Technology (B-AMT), Electronics and Communications (B-EST), Microelectronics and Technology (B-MET), Power Electrical and Electronic Engineering (B-SEE), Teleinformatics (B-TLI)

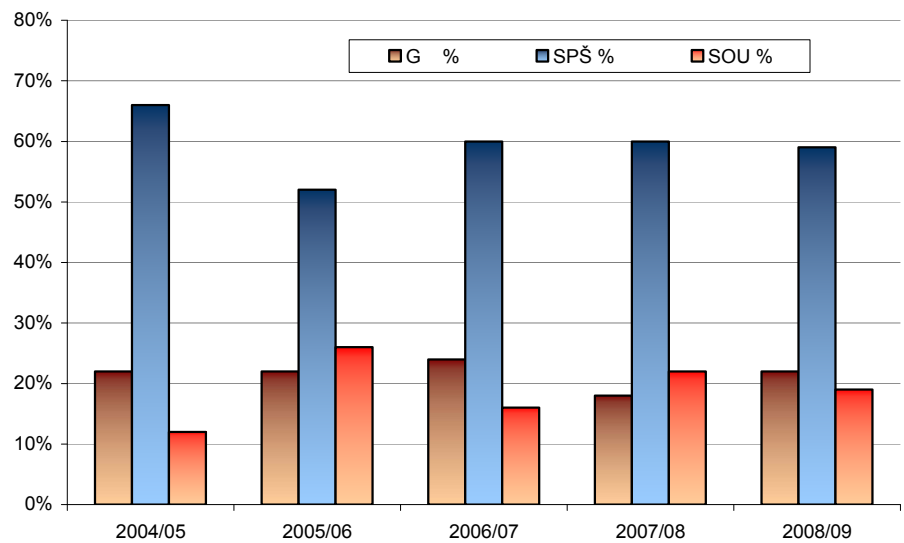
aca-demic year		*B-AMT*	*B-EST*	*B-MET*	*B-SEE*	*B-TLI*	*not given*	*total*
2004/05	number	155	243	77	96	362	119	1052
	%	16,6	26,0	8,3	10,3	38,8		
2005/06	number	153	241	74	120	331	119	1038
	%	16,6	26,2	8,1	13,1	36,0		
2006/07	number	139	172	68	95	221	89	784
	%	20,0	24,7	9,8	13,7	31,8		
2007/08	number	152	178	51	98	195	45	719
	%	22,6	26,4	7,6	14,5	28,9		
2008/09	number	98	127	50	90	153	47	565
	%	18,9	24,5	9,7	17,4	29,5		



Graph 1: Applicants, admitted and enrolled in full-time and part-time study in the EECR programme, 2004/05 – 2008/09



Graph 2: Percentages of students who have taken the school-leaving examination in mathematics or physics



Graph 3: Percentages of students coming from different types of secondary schools (G – secondary schools, SPŠ – secondary technical schools, SOU – vocational training centres)

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

The faculty also provides 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 since academic year 2007/08. In 2008, there were 1070 full-time students in the follow-up Master programme EECR-M, 524 in the first year and 546 in the second year. And there were 115 part-time students of the study programme EECR-ML, 73 in the first year and 42 in the second year.

In 2008, the part-time study programme was completed by 508 students, 41 in the study area Biomedical and Ecological Engineering (M-BEI), 35 in Power Electrical Engineering (M-EEN), 97 in Electronics and Communications (M-EST), 42 in Electrotechnical Manufacturing and Management (M-EVM), 69 in Cybernetics, Automation and Measurement (M-KAM), 26 in Microelectronics (M-MEL), 25 in Power Electrical and Electronic Engineering (M-SVE) and 173 in Communications and Informatics (M-TIT).

The total number of applicants for full-time study in the follow-up Master programme EECR-M (sending in the required application fee) was 827, 677 for EECR-M and 150 for EECR-ML. The maximum numbers of admissions approved by Academic Senate were 600 in full-time study and 100 in part-time study.

Entrance examinations were held on 27 June 2008 at Technická 8, 690 applicants took the examination - 589 in EECR-M and 101 in EECR-ML. Applicants who in the Bachelor programme had achieved the weight study average VSP ≤ 2,0 were exempt from entrance examination. There were 114 such applicants,104 for EECR-M and 10 for EECR-ML. They received a written decision on admission and could enrol in first-year study.

There was a written entrance examination, and contained 10 tasks from 5 subjects approved by the Council of Study Programmes, two tasks from each subject – Electrical Engineering I, Electrical Engineering II, Electronic Components, Signals and Systems, and Measurement in Electrical Engineering. The time was 75 minutes. Applicants were divided in 5 groups with two subgroups A and B. The maximum number of points was 100, 10 for each task. Students who did not sit for BAN3 or KAN3 exam had to pass a test in English language. The result of the test was passed or failed.

The total number of admitted was 610, 535 in full-time study and 75 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 Tab.2.

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 the entrance examination, and the earned credits will be recognized. In 2008, there were 69 students in the lifelong education programme.

In 2008, there were 12 international students in the programme for students paying their fees, 3 in the three-year Bachelor programme EECR, 3 students in the two-year follow-up Master programme and 6 in the Ph.D programme.

Table 2: Numbers of applicants and admitted to study areas of the follow-up Master programmes EECR-M a EECR-ML in 2008: 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), Telecommunication and Information Technology (M-TIT, ML-TIT)

Study area	*Applicants*	*Admitted*	*Study area*	*Applicants*	*Admitted*
M-BEI	73	56	ML-BEI	15	4
M-EEN	34	23	ML-EEN	18	7
M-EST	118	99	ML-EST	15	10
M-EVM	82	58	ML-EVM	15	7
M-KAM	81	65	ML-KAM	20	12
M-MEL	53	42	ML-MEL	8	4
M-SVE	41	34	ML-SVE	18	9
M-TIT	195	158	ML-TIT	41	22

Tuition Support

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

In 2008, regular assessment of the quality of teaching took place at the end of the winter and summer semesters using BUT information system.

In support of tuition in the full-time and part-time Bachelor and the follow-up Master study programmes new or innovated electronic texts (ET) and multimedia aids were created.

All texts are on faculty websites and are accessible to students of a particular programme.

Research and Postgraduate Study

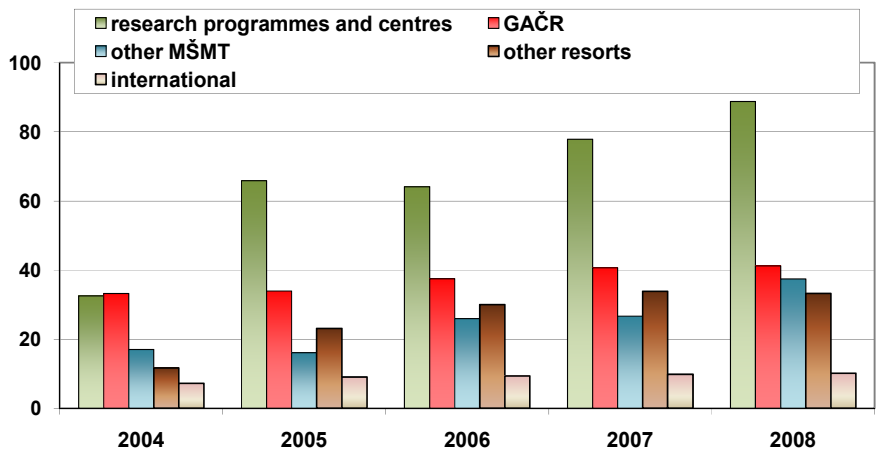
Research

Growth in research continued in 2008, in both funds and quality of research results.

As compared with the previous year, the funding obtained for research and development (graph 4) increased by approximately 11%. The major sources were four research plans followed by Czech Science Foundation projects (GAČR) Ministry of Education projects (MŠMT) and projects conducted in cooperation with industrial companies.

Results of original research and professional work at FEEC were published in five international monographs and 60 articles in leading journals.

Two utility model certificates were awarded, there were more than 150 working samples, a prototype, introduced production, certified technology or authorized software.



Graph 4: Research funds at FEEC in million CZK, 2004 - 2008

Research Plans, Research Centres

Outstanding development and research results in 2008 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. The focus of research are integrated circuits and systems and their elements and technology. The research is based on and supported by modelling and simulation of semiconductor circuits and structures, diagnostics and development of implementation technology.

Involved in the research plan in 2008 were members of academic staff and postgraduate 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 the Faculty of Mechanical Engineering. There were 39 participants in category D1, 35 in category D2 and 7 in category D3 - 15 professors, 12 associate professors, 23 senior lecturers and 2 lecturers, technical staff of 29 and 42 full-time Ph.D. students participating in the research plan. The research plan covered five areas where the following major results have been achieved:

1. Theory, design and diagnostics of low-voltage and low-power integrated circuits (IO) in submicron technologies: Experiments with the CDTA chip designed and produced in the previous year were carried out. A detailed characterization of the CDTA was performed and the obtained data was used to compile a unique SPICE model of the CDTA, which was later used to design a quadrature oscillator. The circuits for the ZC-CDBA element were designed with current regulation into the ZC on the basis on commercial diamond transistors OPA860. The so called PSpice simulation manager (PSim) was designed, able to control the OrCAD PSpice program for simulations in the so called sequence mode. The integrated measuring system (μ-conductometer) was designed for measurement of electrical properties of fluids. The electronic circuits are implemented using the integrated circuit ASIC. The first version of the integrated impedance spectroscope was designed, with a sigma-delta band-pass filter. An integrated circuit was designed using the AMIS CMOS 0,7 μm technology. A reconfigurable integrated circuit REPOMO32 containing polymorphous gates was designed where the application logic can be integrated signals from the environment. The CMOS AMIS 0,7 μm technology was employed. Also designed was a new version of the integrated system for measurement of chemo- and biosensors.

2. Modelling and simulation of integrated circuits: Attention was paid to enhancement of numerical methods including the numerical version of Laplace images and matrix exponential function derivation of the matrix chain of multicast transmission line. Work on construction of a measuring system on the basis of the vector circuit analyzer Agilent E5071C for measurement of s-parameters of transmission systems. Quantum effects in the channel of the nanometer transistor NMOS were simulated using the phenomenological vanDort model and compared with the conventional model which did not consider the quantization effects and with the direct solution of a system of equations (Schroedinger and Poisson) In the same way the „DensityGradient“ model was analyzed, and both models were compared. Emden-Fowler (Fermi-Thomas) discrete equations describing nano-effects were studied, and methods to study the Ljapunov stability condition were found.

3. Microsystems and nanosystems: Design and development of software for control of circuits with conductometer microchip. The coexistence of the wireless communication technology ZigBee and the IEEE 802.15.4 standard within comparative technologies, mainly WiFi and Bluetooth, was considered. Further studied was the possibility of implementation of advanced algorithms for computation of HASH functions into embedded systems with 8-bit cores with strictly limited output. Work continued in the workplace for acoustic emission sensors calibration on the determination of uncertainties of used methods, designed and implemented was the reference capacity sensor and the function of the reference optical sensor of submicron deflections of the tested object surface was verified. Work continued on the development of the contactless electroacoustic sensor. The development of the "Power harvesting" module for wireless sensors supply was commenced. Research of thick-film sensors for operating electrodes created directly by growth of carbon nanotubes on their surface. Bases for deposition of carbon nanotubes were made of silver, gold and platinum thick-film paste. The testing apparatus for hydrogen sensors was prepared and modified. A distributed system containing various modules with sensors for data transfer along the serial line to the superior system was developed. Also developed was a thermostat making use of controlled Peltier coolers fixed to the bottom of a thermally insulated metal compartment. Research also focused on various passivation layers for solar systems based on sputerring of composite materials to prevent degradation of solar cells slowing down their ageing. Research of composite materials suitable for modification of the properties of concrete composites continued. The research was pursued in three areas – exploita-

tion of these materials for shielding, heating and weighing. The required electrical properties of a concrete composite are achieved by adding carbon nanoparticles.

4. Advanced microelectronic and nanoelectronic technologies: Research focused on proving the ability of the thermodynamic sensor (TDS) to monitor the energy balance during a process and the total energy balance in thermodynamic sensors implemented by thick-film technology. Simultaneously the TDS construction was being improved and optimized. Verification and optimization of parameters affecting the quality and reproducibility of print for direct dispension print of viscose materials. Thermal cycling of chip components soldered with various lead-free alloys including the novel Sn100C (Sn, Cu, Ni, Ge). Study of the structure of soldered connections using cuts and microscopic analysis. Modelling of electrical and mechanical properties of microcontacts in semiconductor chips, substrates and carriers with focus on the maximal current load and their measurement on the designed tester in the range up to 10 A. A non-destructive method for detection of impurities on substrates under chips was developed. Experimental studies were commenced focused on implementation of selected operational blocks using the LTCC technology. Optimization of the design process of electronic products, mainly the rules and appropriate software tools to minimize the negative impact on the environment.

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 was evaluated. The continuity equation for stationary current in case of carrier generation through impact ionization. The distribution of conductivity electrons and holes in the junction was and the space charge generated through impact ionization were described. Experimental measurements of temperature dependences of local pn-junction breakdowns were conducted, as well as their identification and determination of the parameters of channels. On the basis of C-U measurements the dependence of the maximal intensity of electric field at the moment of the 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, the capacity sensor was chosen. The impact of interferences in the electromagnetic and acoustic field 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 for study of origin and development of fissures, 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 their origin were described including the mathematical description of individual time constants. Characterization 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 the semiconductor laser line by means of Bragg grids. The methodology was elaborated of local measurement of optical and electrical characteristics on electrical and photonic components.

Research results achieved in 2008 were published in 12 monographs, 73 articles in international journals, 181 presentations at international and national conferences. There were 8 dissertations, 3 habilitation procedures and 2 procedures leading to appointment to professorship were commenced. The research team defended 15 research reports.

In connection with the research plan the team members were involved as investigators and co-investigators in 2 international projects, 19 GAČR projects, 17 FRVŠ projects, 12 MPO projects, 4 GAAV projects and projects for other institutions.

New Generation Electronic Communication Systems and Technologies (ELKOM)

(Investigator: Jiří Svačina)

The research plan is concerned with advanced communication circuits, signals and systems within the entire communication chain. Research is focused on multimedia systems with respect to transmitted signals, transmission channels and technologies. The research plan is scheduled until the end of 2011. Its goal are original outcomes concerning novel communication structures and solution methods, efficient techniques of multimedia signal processing and advanced technologies for new generation communication systems.

Involved in the research plan in 2008 were academics and Ph.D. students of the departments of Radioelectronics, Telecommunications, Biomedical Engineering and Theoretical and Experimental Power Engineering. The investigation team included 16 professors, 22 associate professors, 44 assistant professors and lecturers, technical staff of 16 and 85 full-time Ph.D. students.

The research plan covered 6 areas where the following results were achieved in 2008:

1. New generation wireless and mobile wideband communication systems: Research into propagation of optical links in conditions of extreme atmospheric attenuation, implementation of testing connection at the observatory Milešovka. Development of a receiver input with an avalanche photodiode in closed feedback loop. A new method for determination of an optical signal attenuation due to atmospheric turbulences. An analysis of the communication channel parameters with the HAP system, in cooperation with the Optical Communication Group from the German Aerospace Center. An analysis of control of access to the CDMA mobile communication networks. Reduction of the ratio between the maximal and the medium output (PAPR) of multicast communication signals, an analysis of PAPR reduction application in the new standards DVB-T2 and DVB-H. Research of the novel way of generating binary distribution sequences with exponentially decreasing autocorrelation of functions with the aid of pseudo-chaotic integer number maps.

2. Multimedia and hypermedia communication services and technologies: Research and development of videoconferencing applications, design of a novel structure of integrated videoconferencing multimedia system, its implementation and testing. Research of new principles for water gauging of digital static images. Construction of hierarchical trees in multicast channels, methods of internet coordinate systems and their integration with the method of hierarchical aggregation, design of new algorithms for a higher efficiency of the current standard for RTCP. Design of a distributed and modular architecture of the internet exchange for VoIP integration with conventional telephone sets. Research of multimedia transmission security in the VoIP technology. An experimental research workplace for analysis of methods for IP stations mobility and an experimental network with free MESH topology.

3. High-frequency and microwave communication systems: Research of numerical methods for microwave-structures analysis in the time domain, application of neural networks and global optimization algorithms. Development of a model of active semiconductor line and active antenna (GaAs) with distributed amplification. Development of a wide-band Vivaldi antenna range for mm waves. Development of a prototype of crystal oscillator with rubidium standard for high-stability low-phase signals. Research of special types of combined microwave planar circuits. Analysis and research of suppression EMC filters with undefined input impedance. Continued research of the wide-band measuring system on the principle of microwave hexagon. Research of an efficient calibration of precertification measuring EMC apparatus with ERS sources. Research of methods for localization of nongeostationary satellites, development of an acquisition unit for received signals. Research of methods for measurement of extreme EM quantities. Design and verification of the method with conjugation of orthogonal modes in one-mode fibre.

4. Advanced technologies of integrated communication systems. Modelling and optimization of communication systems by neural network. Verification of the methods for service quality management QoS on the interface end station - transmission network, development of a new protocol for mass data collection in multicast network. Design and development of a communication unit for connection of single-purpose power measurement devices to Internet. Analysis of phase-suspension discrete loops and symbol-delay suspension for coherent demodulators with bilinear transformation, development of an error detector for symbol synchronization. Research of the hierarchical transmission of signals in IPTV systems with a high number of receivers, design of a new algorithm for compiling a distribution tree structure from IPTV system elements. Development of a program for the design of FMT modulator and demodulator filters and its implementation in the signal processor. Methods of cryptographic protection.

5. Special electronic circuits and operating blocks for modern communication systems: Research focused on application of the new element DACA, design and development of samples. New connections of precise rectifiers, cutters and operating transducers with DACA and CMI elements. In cooperation with the research centre for

nanotechnologies CEA-Minatec Grenoble development of special filters for ultra high frequencies with the use of superconductor. Research and verification of a novel structure of feedback oscillator RC for modelling a wide range of dynamic behaviours. Continued research of efficient methods for modelling and simulation of switching DC-DC converters and circuits with switched capacitors. Development of non-standard software for the OrCAD simulator for unlimited expansion of PSpice abilities. Research of the methods of synthesis of synchronous and asynchronous digital systems for high-speed communication, two working samples of data analyzers E1 and STM-1 for the Czech Institute of Meteorology.

6.Digital methods of analysis, processing and transmission of multimedia signals and images: Design of a new method of regularized reconstruction of attenuation images in ultrasonic computer tomography (USCT) including parallelization of computations for practical implementations. Development of methods and software for analysis of the influence of channel characteristics on image signal transmission, design and implementation of an algorithm for evaluation of the quality of videosequences compressed using the H.264/AVC standard and artificial neural network. Research of exploitation of non-hierarchical and hierarchical modulation in the DVB-T signal transmission in models of the Gauss, Riece and Rayleigh channels. Research of efficient methods for automated speech recognition by means of phonetic particularities of spoken Czech. Development of a new method for identification of nonspeech segments of signals. Design of a method for speech enhancement in recordings with random noise.

Research plan results were published in 7 scientific monographs, 167 articles in international and national scientific journals (30 impact journals) and more than 340 presentations at international and national conferences, seminars and workshops.

One Czech technical patent was awarded in 2008 in connection with the research plan, there were 13 partial research and technical reports and 33 technical works, prototypes and authorized software, 15 dissertations, 3 habilitations and 2 appointments to professorship. The investigating team had 42 citations and written responses (more than 30 from abroad).

In connection with the research plan, the members of the team were involved as investigators or co-investigators in another 70 research and development projects (international, GAČR, GAAV, MPO, other institutions) and about 40 FRVŠ development projects.

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 the 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 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 observations.

Research of transport systems with alternative electric energy sources. Exploitation of electric power from small hydroelectric power-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 the genetic algorithm 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.

Research achievements related to plasma converters.

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

Involved in the research plan were academics and Ph.D. students of the departments of Electrotechnology, Power Electrical and Electronic Engineering, Power Electrical Engineering, Theoretical and Experimental Electrical Engineering, Languages and Mathematics. In 2008, there were 25 members of the team in category D1, four

professors, 13 associate professors, and 8 senior lecturers. There were 58 members of the team in category D2, and 13 in category D3. Involved in the research plan in category D2 were 31 Ph.D. students.

The research plan covered four major areas. The following results were achieved during the fourth year of the research plan.

1. Chemical sources of electric energy: Bifunctional electrocatalysts for positive electrodes in fuel cells were improved and research of electrocatalysts for negative electrodes started. Moreover, a new polymer ion-exchange membrane of annex type was synthetized and its properties verified. Material for the positive electrode of lithium-ion accumulators was developed on the basis of $LiCoO_2$ with alkaline dopants. Outside the original project, a sharp increase in electric conductivity of gels containing lithium salts and nanoparticles Al_2O_3 was identified and described. Quartz microbalance was used to monitor penetration of ions into intercalation electrodes. The capacity of carbon electrodes in supercapacitors with nanoparticles was studied, with liquid and gel electrolytes. Relevant mobility values for sodium ions in gels for chemical sources and accumulators were found. Used for calibration of the numerical model were results of analyses for an analogical model. Owing to conducted experiments the degradation mechanisms in lead accumulators working in the PSoC mode for hybrid vehicles were partially elucidated. It was verified that particles of additives act either as nucleus points for crystallization of lead sulphate or 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. Mathematical simulation of current, internal resistance and charge distribution in electrode systems of a lead accumulator helped to find an optimal distribution of current flags in lead accumulator plates.

2. Optimization of electrochemical energy conversion: Work on the prototype of an axial starter with epicyclic gear was completed. The prototype of electronically commuted motor was implemented, computations and design of the sample of a special increased efficiency automotive alternator were accomplished. Computations, construction and production of prototypes of high-speed asynchronous motors were finished. To Increase the efficiency of asynchronous generators, theoretical research and computations were conducted to verify the causes of loaded magnetic circuit oversaturation. Computations and construction of special synchronous electric machines with permanent magnets continued. These are machines with the radial and axial magnetic field for ecological transport, for both electric and hybrid drives. Optimization of these machines using artificial intelligence methods is underway. Also in progress in the development of methods for measuring magnetic, mechanical and thermal parameters of the rotating parts of electric machines. Computer simulations and special measurements relating to the theory of bifurcation and chaos were conducted, and papers have been prepared for publication.

3. Optimization of energy conversion and exploitation in systems with ecological power sources: A simulation model of network supplied from small power sources was constructed and modifications of computing algorithms for voltage quality evaluation in the network were proposed. An experiment in the real high-voltage network was conducted to verify the impact of the type of fault on the fault current, and to verify the function of the model. Work started on algorithms for control of cogeneration units as dissipated sources using the distributed control systems. Operating samples of circuits for electronic ignition and gas mixer servo control. Experiments were conducted with a combined model of thermal pump and solar system. The possibility to exploit the luminescence of solar cells for detection of defects was verified, and a diagnostic method using luminescence was devise. New issues relating to optimization of lighting systems were sought, e.g. optimization of fittings with an ideal luminous intensity curve, seeking potential reserves in calculating illumination from non-point light sources, study of potential problems in representation of photometric parameters due to insufficient photometric formats, not taking into account the effects occurring in lighting systems (changes of voltage, temperature, ageing of sources). An analysis of the possibility of processing CO_2 was conducted, and an interactive database of intelligent systems elements in modern electrical installations was created.

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 motor. The impact of the final charge voltage and of complete dis-

charge as well as the impact of the method of charging were verified. Developed and implemented for this purpose was a fast charger. The vehicle travelled 10 192 km, which are approx. 170 cycles of full charge, the capacity dropped from 39,2 Ah to 35 Ah. A lightweight and efficient fast charger was designed for Ni-Cd traction accumulator of an electric vehicle on the basis of a switching source with fast transistors COOL-MOS (output 16 kW, mass approx. 8 kg). The efficiency, output, hydrogen consumption and other operating characteristics of hydrogen fuel cells were verified. The development of a small electric vehicle with hydrogen fuel cells and an Li-Fe-Po accumulator was completed (asynchronous motor, digital DC/AC converter, DSP power management control fuel cell – accumulator – drive). Theoretical work focused on analytical calculations of setting an optimal slip frequency of the traction asynchronous motor to minimize loss at any arbitrary operating point (moment and revolutions) results are applied in improved control algorithms for our vehicles with asynchronous motor.

Research results were published in 3 scientific monographs, there were 4 papers published in impact ISI journals, 44 papers in reviewed non-impact journals, 216 papers in conference proceedings. There were 12 prototypes and 10 operating models. Two members of the team were habilitated, and 7 members in category D2 defended their dissertations. With support of the research plan investigators and co-investigators organized 4 world conferences.

The members of the team participated in 7 GAČR projects, 1 GAAV project, 4 FRVŠ projects and 4 projects of the Ministry of Industry and Trade. They also participate in one research plan of the Faculty of Mechanical Engineering and in a project of the 6th FP EU.

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 2008 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 4 professors, 8 associate professors, 13 assistant professors and lecturers, technical and administrative staff of 4 and 12 Ph.D. students.

The research plan covered 5 study areas where the following results were achieved in 2008:

1. Smart control and identification algorithms: Software was developed for connecting the PLC B&R with the simulation system Matlab-Simulink. The software was used for verification of control algorithms. An adaptive controller was designed and its implementation on PLC hardware for real-time operation was verified.
Designed and verified on a working sample was an algorithm for estimation of revolutions with guaranteed estimate stability. Algorithms based on spectral analyses were studied. Designed and verified was an algorithm for on-line identification of stator resistance and inductance of motor using vector control.

In the first stage an analysis was conducted of the observability of the state of synchronous motor, then a control system based on the MRAS structure was designed and verified on a working sample.

Mathematical support focused on structured systems (binary multistructures) of preferential relations and Kripke transformation, functional equations with one variable with selected cores in the form of elementary functions, and their solubility. Also studied were the phenomena described by so called hybrid systems by means of Ljapunov-Krasovski functionals, stability criteria, and solution convergence estimates were given.

2.Control of complex systems: Designed and implemented were selected advanced optimization algorithms using artificial intelligence methods (cooperation with Nottingham University, UK). Computations of optimized trajectories of mobile robots were conducted. Control algorithms for intelligent automated systems were implemented, simulation was conducted and working samples designed. The result was a number of utility models, e.g. a multidirectional chassis for

mobile robots and an intelligent weighing and selective system.
The international conference MENDEL 2008 was organized (a reviewed conference, an international programme and organizing committee) with focus on soft-computing, fuzzy, simulation, artificial intelligence)

3. Artificial intelligence and robotics: The robotic system Orpheus-X2 was substantially innovated. There were mechanical improvements – better terrain passability and improvements in electronics and control.
Mathematical support focused on the Choquet integral, fuzzy preferential structures, their characteristics and applications in multicriterial decision, particularly modelling of criteria interactions.

4. Communication networks and systems of processing automation: Research and development in this area focused on quantification of data transfer delay in active elements of Ethernet network to obtain reliable parameters for modelling of active network elements. For this research a measuring workplace was set up for high precision (~ 10 ns) measurement of one-way delay in communication at the interface Ethernet 100BaseT. Industrial control applications increasingly use Ethernet networks as a physical line, and also as a network layer. Precision measurements in the time domain are essential for verification of models of complex active network elements such as switches, and mainly routers, further for diagnostics of extensive networks for prediction of feedback control failure if the required parameters of network infrastructure are not set. In routers, the impact of individual QoS algorithms on the behaviour of the whole element is studied, as to real-time communication parameters. The research and modelling of elements mainly deal with network routers, as real-time communication between subnetworks is coming into demand. Practical experience would not be supported by precision measurements for qualified decisions on applicability of some topologies and network solutions for applications working with directional topologies and requiring time constants of an order of milliseconds to tens of milliseconds (e.g. extensive robotized production lines and systems related to operation security). On the basis of the measured data, a theoretical model of individual active elements is being constructed taking into account communication flow, lines and delays in communication. Another area of research is data collection from vehicle network and evaluation by means of artificial intelligence systems and machine learning. Cooperation was started with the development centre of Škoda Auto a.s.
Research and development of wireless communications focused on reliable network operation and automatic recovery from failures, battery operation of wireless systems and access and safety systems including sensoric networks.

5. Methods and tools for automated measurement: The workplace for primary and secondary calibration of acoustic emission sensors was completed, uncertainties of employed primary calibration methods were determined. Designed and implemented was a reference capacity sensor, and the function of a reference optical sensor of submicron free surface deflections was verified. Work continues on the development of a contactless electromagnetic sensor.
Contact (accelerometers) and contactless (laser-interferometers) sensors were compared and the thermodiagnostic methods of evaluation of vibrations were verified.

A number of reference wide-band sensors working on the piezoelectric, capacity and optical principle were designed and implemented as well as processing of analog signals from microphone fields for the acoustic holography method. In addition to the research plan objectives, research relating to thermodiagnostic issues was commenced.

An article on primary calibration of AE sensors was requested for Journal of Acoustic Emission. Relating to computer vision as a contactless measuring method, new photogrammetric methods were tested on elaborated applications e.g. A Reader of Microdots, A Visual System for Counting Cut Glass Stones.

In 2008, research plan results were published in 3 monographs, 48 articles in international and national journals, 117 presentations at international and national conferences, seminars and workshops. The research team implemented 20 products (4 operating samples, 2 prototypes and 14 SW products), three applications for utility models were submitted, several partial research and technical reports were defended, as well as 1 dissertation and 1 habilitation work. The team received several responses, 6 from abroad.

In connection with the research plan the team members were involved as investigators or co-investigators in 3 international research and de-

velopment projects, 5 GAČR projects, 1 MPO project, 6 FRVŠ projects and at least 10 research and development projects for other institutions.

Research Center 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 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, Čerticin, a.s., Praha, Cygni, s.r.o. Praha, UniControls 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. Zbranek

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

The development of algorithms for identification and control of asynchronous motors continued in 2008, and development of algorithms for synchronous motors was commenced.

A theoretical analysis of the observability of sensorless control of asynchronous motors was conducted. Consequently the analysis was also conducted for synchronous motors. Vector algorithms for adaptive control of asynchronous motors based on the previously designed algorithms for progress identification of parameters.

Designed, simulated and tested were algorithms for identification of the parameters of synchronous motors and their initial position. The available method of synchronous motor control with suppression mode permanent magnets was improved.

The described results were presented at international conferences (PECON 2008, SICE 2008) and in the journal DAAAM International Scientific Book.

2. *Artificial intelligence and robotics*
   Prof. F. Šolc, L. Žalud, F. Burian, T. Neužil, L. Kopečný

Designed and tested was a rescue robotic system ORPHEUS-AC, resistant to effects of chemical substances. The prototype was successfully tested. Work was commenced on the medical version ORPHEUS- AM. Research results involving the system ORPHEUS were presented at the prestigious international conference SSRR 2008 in Sendai, Japan.

3. *Computer Vision;*
   J. Honec, P. Honec, I. Kalová., K. Horák, S. Valach

In 2008 research dealt with the development of methods for image processing, mainly for inspection systems and application of the proposed techniques in industry. The issues of defect recognition in transparent materials, in continuous production and correction of welding laser beam aiming was successfully solved. Research in the field of transport systems focused on the device for independent detection of vehicles by means of an external sensor using the public illumination system in the measured segment. A working sample was constructed, the proposed principle was verified, and an application for patent award for submitted. Hardware tools for data collection and processing on the basis on gate fields and signal processors were developed, for example an open linux embedded control system EUS FSA or the prototype of a fast camera with real-time image evaluation.

4. *Control systems;*
   Prof. F. Zezulka, P. Kučera, O. Hynčica

A dynamic real-time operation model of blank hardening was constructed. The system was offered to a potential user for longterm testing.

The Research Centre of Applied Cybernetics has been achieving outstanding results for the whole period of its existence, and therefore an application for extended funding for 2010 and 2011 was submitted.

Research center of quasioptical systems and terahertz spectroscopy

Coordinator: High School of Chemistry and Technology

(Brno team chief investigator: Zbyněk Raida, co-investigators: Jaroslav Láčík, Michal Pokorný)

Research center of quasioptical systems and terahertz spectroscopy (KVASTES) was established in March 2006 by the High School of Chemistry and Technology, J. Heyrovsky Institute of Academy of Sciences, Czech Technical University and Brno University of Technology. The center is involved in basic research funded by 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 submillimeter waves.

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

In 2008, the Brno branch achieved the following results:

1. The development of the partial components of a spectroscopic system was completed. Selected components were implemented and their properties experimentally verified, or are being prepared for verification. In particular, it is the wide-band antenna range of Vivaldi fissures (operating band 50 GHz to 600 GHz, gain 12 dB in regard to isotropic emitter), a wide-band monopole with coplanar feeding (operating band 1 GHz, gain up to 8 dB in regard to isotropic emitter) and planar synthetic partially filtering mirrors conceived as frequency selective surfaces.

2. There were new findings related to the methods of design and optimization of microwave components in a wide frequency band. Our original approach is based on the development of special numerical techniques of integral equations solution in the time domain (methods with an increased solution stability) and their interconnection with global optimization algorithms (formulation of optimality criteria and their computation directly in the time domain).

3. The development of the model of the spectroscopic apparatus as a whole continued. Emphasis was given on increased efficiency of the model. The function and accuracy of the model were tested in detail by comparison of the behaviour of the model in parts of the spectroscope (vicinity of lenses, polarization filters, angle reflector) with wave models made in commercial projects. An efficient model made possible a detailed parametric analysis of the spectroscope (sensitivity to deflection of axes, displacement, parasitic displacement of polarization lattices and mirrors, etc.) and its optimization.

4. Research of methods for macroscopic description of transmission environment based on the knowledge of microscopic effects (aimed at transmission function of an environment typical of stratospheric and troposheric links in the form of frequency-dependent complex permitivity). One of the studied solutions is based on the description of molecules of water and oxygen by means of quantum mechanics and application of the time-dependent theory of perturbation to achieve dynamic polarizability, a starting point for determination of macroscopic electrical properties.

In the following year the team will focus on the development of a numerical model of multireflection spectroscope cell and on research of exploitation of neural network and global optimization algorithms for representation of rotating gas spectra relating to frequency dependence of complex permitivity.

Research centre ´Data, algorithms, decision-making´

(coordinator: Institute of Information and Automation Theory, Academy of Science 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) mages 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 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 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 for data characteristics and medical needs.

In 2008, the research was based on previous results relating to biomedical applications. It was focused on reconstruction of transmission ultrasound tomography (USCT) images, namely methods of reconstruction of attenuation images (the so called restoration of the parametric field of ultrasound attenuation) in the three-dimensional USCT based of the measuring data, in cooperation with FZ Karlsruhe and implementation and assessment of the synthetic sharpening method with 3D geometry measurement. Design and implementation of solution methods for relating extensive systems of equations (including nonlinear, and newly formulated regularization) in an efficient and finally parallel computational environment. Completion and simulation of a new methodology of computational calibration of the USCT system in the so called blocking version, an article and a dissertation dealt with this research. Simulation of ultrasound in the measuring system was generalized by being elaborated for the 3D solution of the wave equation. The procedures were verified on difficult simulations with up to millions of solved equations, with the gradually decreasing degree of approximation, including attenuation variables and propagation velocity (by sections constant in freely definable areas) in harmonic excitation mode. Algorithms for 3D reconstruction of attenuation maps, including methods of regularized solution of extensive systems of equations were devised. Designed and published was a new method of regularized reconstruction of attenuation ultrasound images (USCT). Another step was an experimental implementation of the synthetic sharpening method in realistic geometry. First results on its efficiency assessment were obtained. An improved method of computational calibration of the USCT system using the geometric characteristics of transducer blocks with algorithms for simulation of the local ultrasound field by way of solution of the wave equation with general attenuation and propagation velocity with increasingly complicated systems with millions of equations.

Research was also focused on advanced methods of vision and processing of two types of ophthalmological retina images: assessment of autofluorescence areas on retina and detection of the retina neural layer on the basis of multimodal images. In research of LASIC we verified the possibility of ´blind image restoration´ optimization with necessarily non-negative interimage, so far blurred. In cooperation with the ophthalmological clinique of University Erlangen, an interactive system of multimodal fitting and analysis of retina images was completed. The system, including a database, was made accessible to ophthalmologists on a special website. Designed and verified were the techniques of narrowing or eliminating the layer of neurons on retina to quantify damages caused by glaucoma, by way of combination of texture analysis methods, and further successful detection of the retina vascular system by means of modified 2D filters. Trial operation (internationally for ophthalmologists) started, the website OPHTALMO was established, containing a set of algorithms developed within the framework of this project with a database of medical images. Outlines of methods for fMRI processing and first results of experimental comparability computations for analysis of fMRI images were published.

An analysis of brain magnetic resonance images (fMRI) in cooperation with the 1st neurological cllinique of the Faculty Hospital Brno-Bohunice. Major methods of measured data processing were studied and implemented with respect to simulation and other measured data (vision of complex data), and an outline and assessment of the methods were published.

All described results were presented and published internationally.

Habilitations and Appointments to Professorship

In 2008, one member of FEEC staff was granted the title of professor and seven new associate professors were appointed

Prof. Dr. Ing. Zdeněk Kolka
Electronics and Communications

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

Doc. Ing. Zdeněk Bradáč, Ph.D.
Technical Cybernetics

Doc. Ing. Jaromír Hubálek, Ph.D.
Power Electrical and Electronic Engineering

Doc. Ing. Roman Maršálek, Ph.D.
Electronics and Communications

Doc. Ing. Karol Molnár, Ph.D.
Teleinformatics

Doc. Mgr. Jan Pavelka, CSc., Ph.D.
Power Electrical and Electronic Engineering

Doc. Ing. Jiří Vaněk, Ph.D.
Power Electrical and Electronic Engineering

Postgraduate doctoral study

In academic year 2008/09, there are 365 students in the doctoral study programme. Among them 8 students are in the study programme in English, and 1 international students receive government scholarship. Numbers of Ph.D. students in individual years of study over the past five years are given in Table 4.

Table 5 shows numbers of doctoral programme graduates at individual departments over the past five years.

A list of doctoral programme graduates in 2008 can be found on FEEC websites, links *Study*, *Doctoral study programme*, *Doctoral programme graduates*.

Table 4: Numbers of doctoral students from 2004 to 2008

year	*2004*	*2005*	*2006*	*2007*	*2008*
1.	87	49	83	92	89
2.	80	71	44	72	84
3.	65	72	67	40	69
4.	48	44	48	43	20
5.	27	33	32	39	35
6.	28	24	29	27	35
7.	31	24	28	40	33
total	**366**	**317**	**331**	**353**	**365**

Table 5: Doctoral programme graduates at FEEC departments from 2004 to 2008

	2004	*2005*	*2006*	*2007*	*2008*	*total*
UAMT	8	3	3	2	3	**19**
UBMI	2	2	0	2	0	**6**
UEEN	6	1	5	0	2	**14**
UETE	0	3	2	0	4	**9**
UFYZ	1	1	0	5	5	**12**
UMEL	3	8	4	6	4	**25**
UREL	1	9	10	7	9	**36**
UTEE	1	2	4	3	0	**10**
UTKO	4	4	10	6	9	**33**
UVEE	3	4	6	4	5	**22**
total	**29**	**37**	**44**	**35**	**41**	**186**

Student Creative Activity

The STUDENT EEICT Conference and Competition was jointly organized by FEEC and FIT on 24 April 2008. The abbreviation conceals the English words Electrical Engineering, Information and Communication Technology indicating the priority areas of research and education at the two faculties. Registered for the competition were 248 papers, 62 Bachelor, 82 Master and 96 doctoral papers and 10 papers presented by secondary school students.

Competition papers were evaluated by expert committees including representatives of sponsoring companies, academics and Student Union representatives. Top 88 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 Affairs

International activities have been aimed at increasing the prestige of FEEC by presenting results of research projects at international conferences and by participating in research and education projects, by making it possible for our students to study at partner universities abroad, and by offering tuition in English to international students.

Among our priorities is student and teacher mobility among universities cooperating within the framework of the 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, and also the Longlife Learning Programme (LLP)/Erasmus. As a result, 42 students could study abroad in the extent of 168 student/months, and 30 teachers were on lecture stays at the length of 27 weeks (see Table 6). Student mobility increased by 8% and the number of student/months was above the five-year average. Teacher mobility increased by 25% in both lecture stays and length of placements and was above the five-year average.

Reciprocally, there has been an increased interest of international students in placements at FEEC. Within the LPP programme there were 47 students coming for placements in the total extent of 169 months, which represents an increase by 62% of student/months in comparison with 2007. Mobility figures for incoming and outgoing students in individual programmes for 2008 are in Table 7. Existing agreements in the LPP-Erasmus programme were renewed. On the whole, the faculty has concluded 44 bilateral agreements. A list of universities cooperating with FEEC on the basis of LPP-Erasmus agreements for academic year 2009/10 is in Table 9. In 2008, the funds from the Development Programme of the Ministry of Education for long-term study and research placements abroad of students of all degree programmes again amounted to 560,000 CZK. Further financial support of 106 thous. CZK was provided by FEEC. There were 23 students on placements at the total length of 75 months within the framework of the Development Programme.

Table 8 shows mobility trends in incoming and outgoing students for all mobility programmes over the past five years. The gradually increasing trend in both incoming and outgoing students, the number of outgoing students can be compared with the previous year. FEEC students' placements amounted to 248 months, which is a decrease by 6% as compared with 2007. Incoming students´ placements amounted to 216 months, which is an increase by 53%.

FEEC supports cooperation of departments and academics with institutions abroad based on interfaculty and LPP-Erasmus agreements as well as newly established contacts. In 2008, the amount of 650,000 CZK was provided in support of such activities. Another 800,000 CZK was provided in support of international activities.

Funds were also obtained from the development programme of 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 in Socrates-Erasmus and Longlife Learning Programme-Erasmus from 2004 to 2008

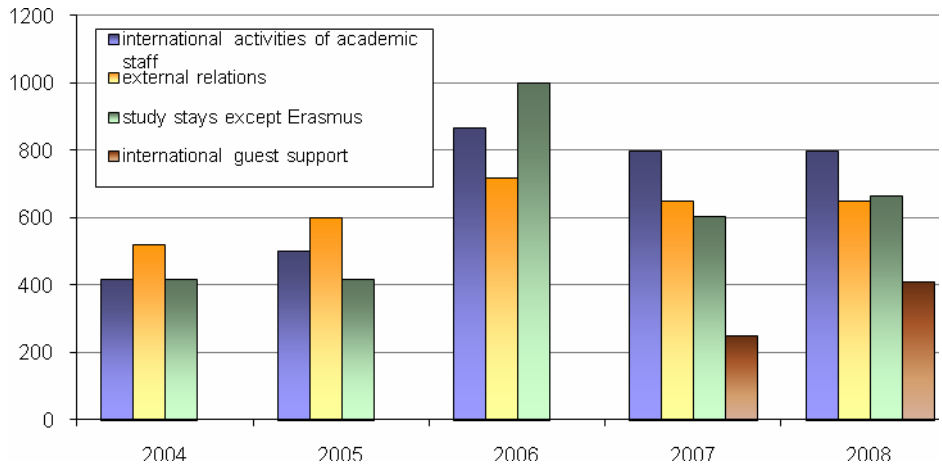
Socrates (LLP)-Erasmus	*2004*	*2005*	*2006*	*2007*	*2008*
Students	42	45	25	39	42
Months	165	161	146	182	168
Lecture stays	28	26	37	24	30
Lecture weeks	38	30	45	27	35

Table 7: Student placements at FEEC and abroad within the framework of various programmes in 2008 – summary

Activity	*Arrivals*		*Departures*	
	Students	*Months*	*Students*	*Months*
Socrates(LLP)-Erasmus	47	169	42	168
CEEPUS	1	4	3	5
Leonardo	1	3	-	-
Inter-university agreements	10	27	-	-
Development programme of Ministry of education	-	-	23	75
Other	5	13	-	-

Table 8: Student placements at FEEC and abroad in all mobility programmes from 2004 to 2008

		2004	*2005*	*2006*	*2007*	*2008*
Arrivals	Students	20	36	34	45	64
	Months	55	113	125	141	216
Departures	Students	55	59	45	68	68
	Months	191	203	221	264	248



Graph 5: Funding of FEEC staff international activities, faculty international activities, student placements outside the Erasmus programme (LLP) and support of international guests in the period 2004-2008 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 Industry and Trade, 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 Luhačovice, 13 -15 May 2008. 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, ABB, Veletrhy Brno, Siemens A.G., Honeywell, T-Mobile Czech Republic, a.s., ON Semiconductor Czech Republic, Rockwell/Allen Bradley, Škoda Volkswagen Mladá Boleslav, Motorola, AMI Semiconductor s.r.o., Celestica, etc.

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 in doctoral programmes. On the basis of an agreement between FEEC and Academy of Sciences Ph.D. students can be educated 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 which concluded Socrates-Erasmus agreements with FEEC for academic year 2009/10

University	Country
Katholieke Hogeschool Brugge-Oostende	Belgium
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
EPITA Paris	France
Groupe ESIEE Paris	France
Institut Catholique de Paris	France
Institut National des Sciences Appliquées de Lyon	France
Institut National Polytechnique de Grenoble	France
Université Joseph Fourier – Polytechnique de l´Úniversité Grenoble	France
Universitá degli Studi Salerno	Italy
Fachhochschule Furtwangen	Germany
Fachhochschule Pforzheim	Germany
Fachhochschule Wiesbaden	Germany
Friedrich-Alexander-Universitat Erlangen	Germany
Hochschule für Technik, Wirtschaft und Kultur Leipzig	Germany
Technische Universität Dresden	Germany
Technische Universität Magdeburg	Germany
Technische Universiteit Delft	The Netherlands
Universitetet i Bergen	Norway
Instituto Politécnico de Lisboa – ISEL	Portugal
Instituto Superior de Engenharia de Coimbra	Portugal

Fachhochschule Oberösterreich	Austria
Technische Universität Wien	Austria
TEI Κρήτης - Παράρτημα Χανίων	Greece
Žilinská univerzita, Elektrotechnická fakulta	Slovakia
Žilinská univerzita, Fakulta prírodných vied	Slovakia
Universidad de Cantabria	Spain
Universidad de Malaga	Spain
Modragon Unibertsitatea	Spain
Universitat Politécnica de Catalunya	Spain
Universidad Politécnica de Valencia	Spain
Universitat de Valéncia	Spain
Universidad de Zaragoza	Spain
Universitat Rovira i Virgili Tarragona	Spain
Högskolan I Halmstad	Sweden
Malmö högskola	Sweden
Boğaziçi Üniversitesi	Turkey
Yeditepe Üniversitesi	Turkey
University of Huddersfield	Great Britain

Academic Senate

From 13 to 15 October 2008, elections to the Academic Senate of the Faculty of Electrical Engineering and Communication were held. Before the elections the members of Academic Senate were (membership in legislative committee – LK, pedagogical committee – PK, economic committee – EK):

Chair

RNDr. Vlasta Krupková, CSc., UMAT

Academic Staff Chamber

Doc. Ing. Jiří Kozumplík, CSc., EK, UBMI, chair
Ing. Petr Baxant, Ph.D., LK, UEEN
Ing. Petr Fiedler, Ph.D., EK, UAMT
Ing. Ivana Jakubová, PK, UREL
RNDr. Vlasta Krupková, CSc., EK,LK, UMAT
PhDr. Ludmila Neuwirthová, Ph.D., PK, UJAZ
Ing. Radovan Novotný, Ph.D., EK,LK, UMEL
Ing. Helena Polsterová, CSc., PK, UETE
Ing. Miloslav Steinbauer, Ph.D., EK,LK, UTEE
RNDr. Naděžda Uhdeová, Ph.D., PK , UFYZ
Doc. Ing. Pavel Vorel, Ph.D., PK, UVEE
Doc. Ing. Václav Zeman, Ph.D., EK, UTKO

Student Chamber

Bc. Irena Hývnarová, LK, chair
up to 19 June 2008
Tomáš Szöllősi, PK, chair since 19 June 2008
Bc. Petr Bílek, PK
Bc. Martin Daniel, EK, LK
Ing. Jiří Hermany, PK
Ing. Kristýna Jandová, PK
Bc. Marian Klampár, PK

Since 24 October 2008 the members of the Senate were:

Chair

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

Academic Staff Chamber

Doc. Ing. Jiří Kozumplík, CSc., EK, UBMI,
Ing. Petr Baxant, Ph.D, EK, UEEN
Ing. Petr Fiedler, Ph.D., 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., UMEL
Ing. Helena Polsterová, CSc., PK, UETE
Ing. Miloslav Steinbauer, Ph.D., LK, UTEE
RNDr. Naděžda Uhdeová, Ph.D., LK, EK, UFYZ
Doc. Ing. Pavel Vorel, Ph.D., UVEE

Student Chamber

Tomáš Szöllősi, PK, chair
Bc. Petr Bílek, LK, PK, EK
Ing. Jan Dolenský
Pavel Hronek, PK, EK
Bc. Marián Klampár, PK, EK
Libor Svoboda, LK
Kateřina Vašková, PK

Academic Senate held 8 regular meetings and one irregular meeting, with an average attendance of 85%. Academic Senate dealt with legislative, economic and pedagogical issues.

In October, elections to Academic Senate were held. There are 4282 voters on the list, 463 of them voted, which is 10.81 %. There were 441 valid votes. Voting was electronic. The BUT Center of Computer and Information Services, in cooperation with FEEC, designed a special module ´Elections and voting´, which can be used for similar purposes.

Academic Senate dealt with proposals for Admission Procedure Regulations for all formats of study for academic year 2009/10 as well as amendments of internal FEEC regulations. Amendments of Election Decree and Rule of Procedure are being prepared for next elections. Academic Senate discussed and approved the economic report for 2007, and the proposal for distribution of funds for 2008 and allotment of education funds.

The Senate dealt with the information systems used at FEEC for tuition, the Information System of Brno University of Technology and the E-learning system (Moodle). Faculty departments were recommended to transfer electronic texts from department and faculty websites into the e-learning system.

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

Used to store drafts of documents and comments to them is the central repository of documents where also earlier documents are kept. It is used for publishing of current documents on websites.

Campus Development

A new library was built in object 1 at Purkyňova 18. For work on a FRVŠ project two computer laboratories were set up at Technická 2, B3.

Modernization of the technical equipment of lecture and seminar rooms and of the computer and information network continued.

Reconstructions

Repairs following the general repair of roof at Technická 2, A3 started at the beginning of 2008 and have been completed at the cost of the company responsible for the repair of the roof.

Construction Works

In the autumn of 2008 competition for construction supplier for the new building of FEEC at Technická 10 took place and at the end of the year ground works started.

Computer Network and Information Systems

Priority was given to:

- upgrading of servers and adaptation of premises
- strengthening of the network of Gb information and communication technologies
- network backup
- innovation and administration of faculty extranet and intranet websites in two languages

Information Systems and Services

The university information system Apollo is now fully in operation at FEEC. Negotiations and analyses of system modules were carried out. Consequently the Apollo system was tuned to functions performed by the previous information system. The process was in progress for the whole year of 2008 and continues in 2009.

Other

Equal Opportunities at FEEC

The ´Consultancy and Information Gender Studies Centre´ continued its activities in 2008.

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 which is among the priorities of the European Union.

The Centre paid attention to promotion of study opportunities for handicapped students. The centre developed contacts with selected secondary schools integrating handicapped students, and taking into account the specific needs of such students.

The Centre cooperates with the Department of Physics, Student Union and other departments´ staff members.

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 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, 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. (ÚRE AVČR)

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Student Activities

Active at the Faculty of Electrical Engineering and Communication are the following student organizations: Student Chamber of Academic Senate, club Students for Students, and Student Union. The Student Chamber of Academic Senate is the partner to the faculty leadership, provides contacts with students and contributes to mutual exchange of information – it is an intermediary between the faculty and the students. The Student Chamber provides information covering the whole spectrum of study and faculty life.

The voluntary club Students for Students associates students of FEEC who want to help their fellow students. The role of the club is to enrich student life and help the Student Chamber to pass information to all students. Every student of FEEC can apply for membership of the club.

The student organizations co-organized the traditional Representation ball of FEEC and FIT, and organized a meeting with the faculty leadership. Every other month, the club Students for Students publishes the student magazine E-fekt in an edition of 1200 copies. In 2008, there were 5 issues. The special September issue ´A first-year student handbook´ was distributed to all first year students.

The Student Chamber and the club Students for Students contributed to improving the process of instruction quality assessment. They co-organized the student conference and competition EEICT 2008. Volunteers helped with presentation of FEEC at the trade fair Gaudeamus and on Open Days at FEEC. Both organizations joined the activity of the Student Union at FIT in support of giving blood – A drop of blood.

The club Students for Students organized the first year of the competition of student music groups Music at FEEC, with 7 participating groups. The winner was the group P.S.U Maleč (FEEC student – Bc. Aleš Ležák). In support of student sports activities the club organized the competition Run to 53. The task was to get over the distance from the Integrated object Kolejní 4 to the nearby stop of bus no.53. as fast as possible. There were numerous student participants and also several members of the staff took part. The club also organized several social events, e.g. the Welcome party for first-year students, BT-BIO party, Kite Parade. Designed and made were student t-shirts with the FEEC logo as an addition to official faculty promotion products.

Department of Control and Instrumentation

Prof. Ing. Pavel Jura, CSc.

Head

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Professors

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

Associate Professors

Doc. Ing. Ludvík Bejček, CSc.
Doc. Ing. Petr Beneš, Ph.D.
Doc. Ing. Petr Blaha, Ph.D.
Doc. Ing. 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, 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.

Postgraduate students

Ing. Jan Beran, Ing. František Burian, Ing. Luděk Caha, Ing. Luděk Červinka, Ing. Jolana Dvorská, Ing. Martin Dvořáček, Ing. Petr Fidler, Ing. František Gogol, Ing. Petr Hliněný, Ing. Luděk Chomát, Ing. Jan Chovanec, Ing. Ondřej Jež, Ing. Peter Kacz, Ing. Václav Kaczmarczyk, Ing. Zdeněk Kaňa, Ing. Marek Kváš, Ing. Ondřej Lebeda, Ing. Petr Malounek, Ing. Vojtěch Mikšánek, Ing. Vojtěch Němec, Ing. Jan Pohl, Ing. Petr Polách, Ing. Václav Sáblík, Ing. David Skula, Ing. Jan Srb, Ing. Jaroslav Šembera, Ing. Miroslav Uher, Ing. Jan Valenta, Ing. Libor Veselý, Ing. Miloš Veselý, Ing. Pavel Zbranek, Ing. Martin Žurek

Administrative and Technical Staff

Ing. Luděk Anděra, Ing. Jan Beran, Ing. František Burian, Ing. Zdeněk Havránek, Ing. Jakub Hrabec, Ing. Ondřej Hynčica, Ing. Jiří Keprt, Ing. Jan Pásek, CSc., Lenka Petrová, Ing. Petr Petyovský, Jan Vodička, Miloš Zbořil

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, Ing. Pavel Kučera, Ph.D., Ing. Tomáš Neužil, Lenka Petrová, Ing. Jaroslav Šembera, Ing. Soběslav Valach, Ing. Libor Veselý, Ing. Miloš Veselý, Ing. Pavel Zbranek, doc. Ing. Luděk Žalud, Ph.D.

Main Interests

The department guarantees tuition in the Bachelor degree programme Automation and Measurement Technology and the follow-up Master degree programme Cybernetics, Automation and Measurement. Tuition and research correspond to the five technical 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 the building control, safety and authorization systems. The group closely cooperates with companies such as BD Sensors, Beta Control, Siemens, Škoda Auto and others.

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 Větřní, Police of the Czech Republic). Tuition is also focused on applications, mainly the new Master programme subject Computer Vision Applications.

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 aim is to design modern control algorithms on artificial intelligence principles and to secure their supervision and monitoring with focus on application in real environment.

The group of artificial intelligence and robotics has been involved in long-term 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, thermodiagnostics, acoustic emissions, flux measurements and noise measurements.

In 2008, the group of measurements dealt with two GAČR projects and the European Project CREDO.

Major Achievements

The study and implementation of a prototype for the device to measure the thickness of polyuretan foam, carried out for the company LANIK - Techservis Boskovice, is the department's most important achievement.

A group of department's members involved in the project Virtual Automation Network (VAN) within the Integrated Project of the 6th Framework Programme organized a two-day international conference VAN International Meeting in October 22 – 23, 2008. Representatives of all twelve research, development and production institutions in the project partnership participated in the conference. A testing device TestQoS for accurate measurement of communication network parameters on the basis of Ethernet technology was developed to evaluate QoS availability. The system was developed within the project VAN of the 6th Framework Programme. The laser beam position modifier, prototype for reduction of objective control and TCP/IP stack for DSP software TMS320C64X were completed. A working sample of a servo drive with synchronous motor with sensorless control and advanced method of moment maximization was developed. Algorithms for localizing noise sources in a cabin by means of the double-layer microphone field were implemented within the framework of the CREDO project and a workplace for calibration of acoustic emission sensors corresponding to ASTM standards was put into operation.

Major Research Projects

Intelligent Control Algorithms for Electric Drives with Induction and Synchronous Motors – GAČR 102/06/0949
Investigator: Pavel Václavek

Analysis of Model Components of a System for Acoustic Emission Method – GAČR 101/06/1689
Investigator: Petr Beneš

Cabin Noise Reduction by Experimental and Numerical Design Optimization – 6th FP EU 030814-6
Co-investigator: Petr Beneš

Automation Intelligent Systems – MŠMT MSM0021630529
Investigator: Pavel Jura

Modern Approaches to Measurement of Vibrations – GAČR 102/06/1617
Investigator: Ludvík Bejček

Softcomputing Control Methods – GAČR 102/06/1132
Investigator: Petr Pivoňka

Virtual Automation Network (VAN) – 6th FP EU 016969
Co-investigator: František Zezulka

Development of a Universal Control System – MPO FI-IM3/040
Investigator: Pavel Jura

Research and Development of an Economical Information and Safety System for Housing Construction and Modernization of Old and Mainly Panel Houses – TANDEM FT-TA2/087
Investigator: Zdeněk Bradáč

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

Selected Publications

BLAHA, P.; VÁCLAVEK, P. Stator resistance estimation of AC induction motor drive. DAAAM International Scientific Book, 2008,vol. 2007, no. 1, pp. 307-315. ISSN: 1726-9687.

BLAHA, P.; VÁCLAVEK, P. The Implementation of Parameters Identification of Permanent Magnet Synchronous Motor in MC56F8346. DAAAM International Scientific Book, 2008, no. 1, pp. 75-84.

KRONTORÁDOVÁ, K.; HONZÍKOVÁ, N.; FIŠER, B.; NOVÁKOVÁ, Z.; ZÁVODNÁ, E.; HRSTKOVÁ, H.; HONZÍK, P. Overweight and Decreased Baroreflex Sensitivity as Independent Risk Factors for Hypertension in Children, Adolescents, and Young Adults. Physiological Research, 2008, vol. 57, no. 3, pp. 385-391. ISSN: 0862-8408.

NEUŽIL, T. Simultaneous Mapping and Navigation for Skid Steered Mobile Robot. In Advanced Topics on Signal Processing, Robotics and Automation. WSEAS Press, 2008.pp. 93-98.

PIVOŇKA, P.; VELEBA, V. Adaptive Controllers by Using Neural Network Based Identification for Short Sampling Period. INTERNATIONAL JOURNAL of CIRCUITS, SYSTEMS and SIGNAL PROCESSING, 2008, vol. 1, no. 1, pp. 62-67. ISSN: 1998-0140.

ŠEMBERA, J.; ŠOLC, F. Model of a Skid Steered Robot. WSEAS Applied Informatics & Communications, 2008, vol. 7, no. 1, pp. 61-65. ISSN: 1790-5117.

VÁCLAVEK, P.; BLAHA, P. AC Induction Machine Speed Estimation using Electrical Quantities Harmonic Analysis. DAAAM International Scientific Book, 2008, vol. 2007, no. 1, pp. 243-256. ISSN: 1726-9687.

VÁCLAVEK, P.; BLAHA, P. Observability Theory Application to AC Induction Machine Sensorless Control. DAAAM International Scientific Book, 2008, vol. 2008, no. 1, pp. 903-918. ISSN: 1726-9687.

Bachelor Programme

Computer Control (Petr Pivoňka)
Computer Science in Automation (Petr Pivoňka)
Control Theory 1 (Petr Vavřín)
Control Theory 2 (Petr Vavřín)
Databases Systems (Radovan Holek)
Electronic Measurement Systems (Miloslav Čejka)
Fibre Optics in Automatization (Ludvík Bejček)
Fundamentals of Robotics (Luděk Žalud)
Industrial Automation (František Zezulka)
Measurement of Physical Quantities (Ludvík Bejček)
Microprocessors (Tomáš Macho)
Modeling and Simulation (Pavel Václavek)
Modern Means in Automation (Václav Jirsík)
PC subsystems (Jozef Honec)
PCs in Instrumentation (Miloslav Čejka)
Practical Programming in C++ (Miloslav Richter)
Programmable Logics Controllers (František Zezulka)
Signals and Systems (Pavel Jura)

Master Programme

Application of Computer Vision (Ilona Kalová)
Artificial Intelligence (Václav Jirsík)
Computer Vision (Karel Horák)
Computers for Control (Zdeněk Bradáč)
Data Acquisition, Analysis and Processing (Miloslav Čejka)
Distributed Systems and Networks (Petr Fiedler)
Electronic Measurement Technics (Miloslav Čejka)
Embedded Systems for Industrial Control (Zdeněk Bradáč)
Fuzzy Systems (Pavel Jura)
Intelligent and Semiconductor Sensors (Petr Beneš)
Intelligent Controllers (Petr Pivoňka)
Logical Systems (Radovan Holek)
Machine Learning (Petr Honzík)
Measurement in Nonelectrical Quantities (Ludvík Bejček)
Modelling and Identification (Petr Blaha)
Operating Systems and Networks (Tomáš Macho)
Optimization of Controllers (Petr Pivoňka)
Optoelectrical Sensors (Ludvík Bejček)
Process Automation (František Zezulka)
Real-time Operation Systems (Pavel Kučera)
Robotics (Luděk Žalud)
Robust and Algebraic Control (Petr Blaha)
Sensors of Nonelectrical Quantities (Ludvík Bejček)
Systems of Discrete Events (Pavel Václavek)
Theory of Dynamic Systems (Petr Vavřín)

Doctoral Programme

Selected Chapters from Automatic Control (Petr Pivoňka)
Selected Chapters from Measurement Technology (Ludvík Bejček)

Laboratories

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

Laboratory of Electrical Measurement (second-year study areas B-AMT, B-MET, B-SEE and part-time second-year study areas BK-AMT, BK-SEE, Miloslav Čejka 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 Measurement (air-track for flux measurement evaluation, doctoral research laboratory, Ludvík Bejček)

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

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

Laboratory of Optoelectronics (optical fibre sensors and 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 a 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

Prof. Ing. Jiří Jan, CSc.
Head

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61200 Brno 12
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Professors

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

Associate Professors

Doc. Ing. Aleš Drastich, CSc.
Doc. MUDr. Václav Chaloupka, CSc.
Doc. Ing. Milan Chmelař, CSc.
Doc. Ing. 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. Radim Kolář, Ph.D., Ing. Jana Kolářová (née Bardoňová)

Postgraduate Students

Ing. Mouin Al Khaddour, Ing. Michal Bartoš, Ing. Petr Čech, Ing. Martin Čížek, Ing. Vratislav Čmiel, Ing. Jiří Dlouhý, Ing. Jiří Gazárek, Ing. Vratislav Harabiš, Ing. Martin Havlíček, Ing. Jan Hrozek, Ing. Jan Hrubeš, Ing. Oto Janoušek, Ing. Denisa Maděránková, Ing. Miloš Malínský, Ing. Jan Odstrčilík, Ing. Pawan Kumar Pathak, Ing. Roman Peter, Ing. Jiří Roleček, Ing. Milan Rychtárik, Ing. Jiří Sekora, Ing. Lukáš Smital, Ing. Martin Švrček, Ing. Pavel Taševský, Ing. Martin Valla, Ing. Martin Vítek, Ing. Jiří Wolf

Administrative and Technical Staff

MUDr. Kateřina Fialová, Mgr. Dušan Hemzal, Ph.D., Lenka Chmelíčková, Anna Oujeská, Mgr. Igor Peterlík, 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.

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 (investigator J. Svačina) and by national grant projects on modelling of the origin and analysis of cardiological electric signals, including a further development of a unique apparatus for simultaneous recording of heart activity by optical and electrical methods for detection of ischemia.

Instruction is centred on the development of 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 the 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, and the laboratory of biophysics, which was reconstructed and refurnished. New laboratories of genetic analysis and optical representation systems are set up.

Major Achievements

Members of the department were investigators of several research projects, whose results were published in scientific journals and presented at reputable international conferences. Four authors published their articles in significant impact magazines in the area of experimental scanning of biological signals and medical image processing.

Medical image processing was investigated especially within the framework of the National Research Centre DAR coordinated by the Institute of Information Theory and Automation of Academy of Sciences in Prague. Papers on ultrasonic transmission tomography, physically accurate simulation of ultrasonic field, publications dealing with analysis of ophthalmologic image data and OPHTALMO software, available on the Internet to the ophthalmologists from all over the world, were completed. Moreover, the department dealt with partial projects on the analysis of blood circulation through heart tissues on the basis of ultrasonic tomographs, the joint project with the Philips company concerning the medical image fusion and the project regarding physical-technical problems of ultrasonic representation also supported by GAČR .

The department also dealt with reading electrical signals in living organisms within two grant projects GAČR. It included reading electrical signals in the heart muscle by means of the optical method using voltage-sensitive dyes and the measurement of ion currents in isolated heart cells by the patch clamp method.

Construction of new laboratories of genetic analysis and optical representation systems was initiated and the equipment was prepared. The laboratories will be used for both research and instruction. In 2008, the department organized the reputable biennial conference BIOSIGNAL under the auspices of the European association EURASIP and the world organization IEEE – EMBS. One hundred and sixty participants from twenty three countries attended this conference.

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

Topographic colour fused image as a new imaging modality for web-based support of glaucoma diagnosis – D20-CZ8/07-08
Investigator: Jiří Jan

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

Selected Publications

JIŘÍK, R.; TAXT, T. Two-Dimensional Blind Bayesian Deconvolution of Medical Ultrasound Images. IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, 2008,vol. 55, no. 10, pp. 2140-2153. ISSN: 0885-3010.

KOLÁŘ, R.; JAN, J.; KUBEČKA, L. Registration and Fusion of the Autofluorescent and Infrared Retinal Images. International Journal of Biomedical Imaging, 2008, no. 513478, pp. 1-11. ISSN: 1687-4188.

MIKL, M.; MAREČEK, R.; HLUŠTÍK, P.; PAVLICOVÁ, M.; DRASTICH, A.; CHLEBUS, P.; BRÁZDIL, M.; KRUPA, P. Effects of spatial smoothing on fMRI group inferences. MAGNETIC RESONANCE IMAGING, 2008, vol. 26, no. 4, pp. 490-503. ISSN: 0730-725X.

NOVÁKOVÁ, M.; BARDOŇOVÁ, J.; PROVAZNÍK, I.; TÁBORSKÁ, E. Effects of voltage sensitive dye di-4-ANEPPS on guinea pig and rabbit myocardium. General Physiology and Biophysics, 2008,vol. 26, no. 1, pp. 45-54. ISSN: 0231-5882.

ORBAN, M., BRUCE, CJ., PRESSMAN, GS., LEINVEBER, P., ROMERO-CORRAL, A., KOŘÍNEK, J., KONEČNÝ, T., VILLARRAGA, HR., KÁRA, T., CAPLES, SM., SOMERS, VK. Dynamic Changes of Left Ventricular Performance and Left Atrial Volume Induced by the Mueller Maneuver in Healthy Young Adults and Implications for Obstructive Sleep Apnea, Atrial Fibrilation, and Heart Failure. American Journal of Cardiology, 2008, pp. 1557-1561. ISSN: 0002-9149.

PÁSEK, M.; ŠIMURDA, J.; CHRISTÉ, G.; ORCHARD, C. Modelling the cardiac transverse-axial tubular system. Progress In Biophysics & Molecular Biology, 2008, vol. 2008 (96), no. 1-3, pp. 226-243. ISSN: 0079-6107.

Bachelor Programme

Algorithmization and Programming (Jana Kolářová)

Biology of Man (Nataša Honzíková)

Computers and Programming 1 (Ivo Provazník)

Digital Signal Processing and Analysis (Jiří Jan)

Ecology in Electrotechnical profession (Jiří Rozman)

Introduction to Medical Informatics (Ivo Provazník)

Medical Diagnostic Devices (Radim Kolář)

Multimedia Signals and Data (Jiří Jan)

Therapeutic and Prosthetic Instruments (Jiří Rozman)

Master Programme

Advanced Methods of Signal Processing (Jiří Jan)

Analysis of Signals and Images (Jiří Jan)

Biology of Man (Nataša Honzíková)

Bionics (Jiří Kozumplík)

Biophysics (Jiří Šimurda)

Clinical Physiology (Václav Chaloupka)

Computer-Aided Medical Diagnostics (Ivo Provazník)

Design and Operation of Complex Systems (Jiří Rozman)

Diagnostics of Bio- and Ecosystems (Milan Chmelař)

Ecological Engineering (Jiří Rozman)

Healthcare (Jindřich Vomela)

Introduction to Environmental Studies (Hana Librová)

Medical and Ecological Imaging Systems (Aleš Drastich)

Medical Information Systems (Ivo Provazník)

Medical Systems Design (Karel Jehlička)

Modelling of Biological Systems Radovan Jiřík)

Multirate Systems (Jiří Kozumplík)

Special Devices for Healthcare and Ecology (Jiří Rozman)

Tomographic Imaging Systems (Aleš Drastich)

Doctoral Programme

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

Selected Problems of Biomedical Engineering (Jiří Jan)

Laboratories

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

Laboratory of Biomedical and Ecological Technology (instruction in Therapeutic and Prosthetic Technology, Specialized Medical and Ecological Technology, Introduction to Environmental Studies, Ecological Engineering, Design and Operation of Complex Systems, experiments in research and student projects, Jana Kolářová)

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

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

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

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

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.)

Construction Laboratory (mechanical and electrotechnical tasks for research related to student projects, Jaroslav Sedláček, Hana Rýznarová)

Department of Electrical Power Engineering

Doc. Ing. Petr Toman, Ph.D.

Head

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Associate Professors

Doc. Ing. Vladimír Blažek, CSc.
Doc. Ing. Evžen Haluzík, CSc.
Doc. Ing. Antonín Matoušek, CSc.
Doc. Ing. Jiří Raček, CSc.
Doc. Ing. Petr Toman, Ph.D.
Doc. RNDr. Oldřich Coufal, CSc.

Lecturers

Ing. Petr Baxant, Ph.D., Ing. Jiří Drápela, Ph.D., Ing. Ilona Lázničková, Ph.D., Ing. Petr Mastný, Ph.D., Ing. Jaroslava Orságová, Ph.D.

Postgraduate Students

Ing. Branislav Bátora, Ing. Martin Belatka, Ing. Jan Macháček, Ing. Jiří Malý, Ing. Zdeněk Matoušek, Ing. Alexej Nováček, Ing. Martin Paar, Ing. Lukáš Potáček, Ing. Zdeněk Procházka, Ing. Václav Prokop, Ing. Jaroslav Špaček, Ing. Jiří Uher, Ing. Libor Weidinger, Ing. Michal Závodný, Ing. Jan Pithart, Ing. Jan Šlezingr, Ing. Lukáš Radil, Ing. Tomáš Bartošík, Ing. Nail Khisamutdinov, Ing. Almabrok Abdoalhade Almabrok, Ing. Vojtěch Lakomý, Ing. Drahomír Pernica, Ing. David Topolánek, Ing. Jan Škoda, Ing. Jaromír Bok

Administrative and Technical Staff

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

Main Interests

The department provides tuition in the Bachelor degree programme Power Electrical and Electronic Engineering in cooperation with the Department of Power Electrical and Electronic Engineering, and in the Master degree programme Power Electrical Engineering. 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 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 implementation of an expert system for space illumination in special conditions of vision. The department cooperated with a number of companies, e.g. E.ON, Siemens, EGÚ Brno, ABB, ČEPS, ČEZ, Teplárny Brno, ABB s.r.o. and other. Cooperation continued with the departments of power electrical engineering at all Czech and Slovak technical universities.

Major Achievements

In 2008, the department staff were involved in the research plan “Sources, accumulation and optimization of energy exploitation in the conditions of permanently sustainable growth“, three grant projects MŠMT, two projects NPV II, one project FRVŠ and nineteen projects of cooperation with industry. The department organized the conference Electric Power Engineering 2008 with participation of 120 experts including thirty participants from abroad. The conference proceedings became a part of the international database Thomson Reuters.

The department’s most significant achievements published in reputable scientific journals and in proceedings of international conferences are e.g. the method for accurate inductance calculation of a coaxial cable and a tube conductor, the methodology for using combined systems, the heat pump – solar collector in low-energy buildings, the system for measurement and data acquisition from solar systems for evaluating the efficiency of sources, the dynamic model for parallel network simulation and asynchronous generator powered by a combustion engine, the design and implementation of models of flicker meters and systems for automation measurement of limit curves of interharmonic voltages in light sources and the methodology for feed optimization of 1f appliances in renewable energy networks.

In 2008, the department continued to cooperate with the Institute of Plasma Physics of the Czech Academy of Sciences in the Joint Plasma Laboratory. Cooperation with EGU Brno centred on connecting wind-powered stations and with Unicontrols-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.

The Laboratory of Electric Power Generation was equipped with three new motor-generator sets controlled by a frequency converter and the instruction in nuclear power plants was innovated within the project “Development of Nuclear Power Education at Universities in the Czech Republic“.

Major Research Projects

Thermodynamic and Transport Properties of Electric Arc Plasma – GAČR 102/06/1337
Investigator: Oldřich Coufal

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

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

Selected Publications

BAXANT, P. Interaction of Cogeneration Units With Combustion Engine During Parallel Working In The Power Network. Technična elektrodynamika, 2008, vol. 2008, no. 1,pp. 24-29. ISSN: 0204-3599.

BAXANT, P. Photometric data of luminaires and their proper application. Przeglad Elektrotechniczny, 2008, vol. 2008, no. 8, pp. 57-60. ISSN: 0033-2097.

BLAŽEK, V.; SKALA, P. Application of the Theory of Games in Planning of Maintenance Strategy of Circuit Breakers. Technična elektrodynamika, 2008, vol. 29, no. 2, pp. 42-46. ISSN: 0204-3599.

COUFAL, O. Current density in a long solitary tubular conductor. Journal of Physics A-Mathematical and Theoretical, 2008, vol. 41, no. 14, pp. 145401-145414. ISSN: 1751-8113.

CZERNEK, J.; ŽIVNÝ, O. An ab initio description of the low-lying electronic states of NF2 and its ions. Chemical Physics Letters, 2008, vol. 457, no. 1-3, pp. 54-57. ISSN: 0009-2614.

CZERNEK, J.; ŽIVNÝ, O. An MRCI investigation of the electronically excited states of difluorocarbene and its monovalent ions. MOLECULAR PHYSICS, 2008, vol. 106, no.14, pp. 1761-1765. ISSN: 0026-8976.

CZERNEK, J.; ŽIVNÝ, O. Low-lying electronic states of SF2 and its ions as studied by the MRCI technique. Chemical Physics, 2008, vol. 344, no. 1-2, pp. 142-146. ISSN: 0301-0104.

CZERNEK, J.; ŽIVNÝ, O. The Multiconfigurational-reference Internally Contracted Configuration Interaction/Complete Basis Set Study of the Excited States of the Trifluoride Anion F3-. The Journal of Chemical Physics, 2008, vol. 129, č. 19, p. 194305-1 (4 pp.)ISSN: 0021-9606.

GREGOR, J.; JAKUBOVÁ, I.; MENDL, T.; ŠENK, J. Structure of hot mixture free jet at the arc-heater output. Chemické listy, 2008, vol. 102, no. 16, pp. 1364-1367. ISSN: 0009-2770.

GREGOR, J.; JAKUBOVÁ, I.; ŠENK, J. Analysis of energy and mass flows in an arc heater with intensively blown electric arc. Chemické listy, 2008, vol. 102, no. 16, pp. 1408-1413. ISSN: 0009-2770.

MASTNÝ, P. Optimization of Combined Operation of Heat Pump and Active Solar System. WSEAS Transaction on Heat and Mass Transfer, 2008, vol. 1, no. 9, pp. 721-729. ISSN: 1790-5044.

MASTNÝ, P.; MACHÁČEK, J. System for Measuring and Collecting Data - Results of Measuring on Combined System -. WSEAS Applied Informatics & Communications, 2008, vol. 10, no. 1, pp. 192-197. ISSN: 1790-5117.

MASTNÝ, P.; MACHÁČEK, J.; MATOUŠEK, A. Renewable Energy Sources in Combined Systems - On-line System for Measuring and Collecting Data. International Journal of Energy, 2008, vol. 1, no. 3, pp. 59-64. ISSN: 1998-4316.

MASTNÝ, P.; MACHÁČEK, J.; MATOUŠEK, A. Renewable Energy Sources in Combined Systems - On-line System for Measuring and Collecting Data. WSEAS Journal Transactions on Environment and Development, 2008, vol. 4, no. 1, pp. 6-11. ISSN: 1790-5079.

ORSÁGOVÁ, J.; TOMAN, P. Thermal Models of Cables in Digital Protective Terminals. Technična elektrodynamika, 2008, vol. 1, no. 1, pp. 105-108. ISSN: 0204-3599.

ŠKODA, J.; BAXANT, P. Non-pointed luminaires and their photometry. Przeglad Elektrotechniczny, 2008, vol. 2008, no. 8, pp. 44-46. ISSN: 0033-2097.

TOMAN, P.; ORSÁGOVÁ, J. Location of The Ground Faults in MV Networks. Technična elektrodynamika, 2008, vol. 2008, no. 388, pp. 38-41. ISSN: 0204-3599.

Bachelor Programme

Computer Modelling and Simulations (Petr Baxant)

Design in power electric systems (Petr Toman)

Distribution Equipment (Jaroslava Orságová)

Economy and Control (Petr Toman)

Electrical Power Distribution (Petr Toman)

Electrical Power Generation (Petr Mastný)

Energy Use (Jiří Drápela)

Environmental Science in Electroenergetic (Antonín Matoušek)

High Voltage and Electric Apparatus (Vladimír Blažek)

Machinery of Power Plants (Jiří Raček)

Protection of Electrical Power Equipment (Petr Toman)

Technical Mechanics (Jiří Raček)

Master Programme

Application of Electric Arc (Jan Gregor)

Diagnostics in Electricity Industry (Jiří Drápela)

Economy of Electrical Power Engineering (Petr Toman)

Electrical Heat Technology (Ilona Lázničková)

Information and Control Systems in Power Engineering (Petr Baxant)

Innovation in Power Engineering (Petr Toman)

Integrated Protection Systems (Petr Toman)

Lighting Systems (Petr Baxant)

Lighting Technology (Petr Baxant)

Low Power Electrical Sources (Petr Mastný)

Municipal and Industrial Power Networks (Jaroslava Orságová)

Nuclear Power Plant (Jiří Raček)

Power Energetic Equipments (Jiří Raček)

Power Plants and Heating Power Stations (Antonín Matoušek)

Power Quality and EMC (Jiří Drápela)

Power Systems (Jaroslava Orságová)

Power Systems Control (Petr Toman)

Power Transmission Networks (Vladimír Blažek)

Some Chosen Issues of Power Engineering (Vladimír Blažek)

Substations and Lines (Jaroslava Orságová)

Transient Phenomena (Evžen Haluzík)

Unconventional Conversions (Antonín Matoušek)

Doctoral 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 the Quality of Electric Power and Electromagnetic Compatibility (instruction in Quality of Electric Power, EMC 1 and 2, Diagnostics in 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, Jaroslava Orságová)

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

Prof. Ing. Jiří Kazelle, CSc.

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Prof. Ing. Jiří Vondrák, DrSc.

Associate Professors

Doc. Ing. Petr Bača, Ph.D.
Doc. RNDr. Milan Calábek, CSc.
Doc. RNDr. Miroslav Cenek, CSc.
Doc. Ing. Josef Jirák, CSc.
Doc. Ing. Marie Sedlaříková, CSc.
Doc. Ing. Jiří Vaněk, Ph.D.

Lecturers

Ing. Martin Frk, Ph.D., Ing. Svatopluk Havlíček, CSc., Ing. Petr Křivík, Ph.D., Ing. Jiří Maxa, Ph.D., Ing. Vítězslav Novák, Ph.D., Ing. Helena Polsterová, CSc., Ing. Zdenka Rozsívalová, Ing. Jiří Starý, Ph.D., Ing. Jiří Špinka

Postgraduate Students

Ing. Peter Barath, Ing. Radek Bilko, Ing. Pavel Černoch, Ing. Martin Dočkal, Ing. Tibor Jirák, Ing. Roman Kameník, Ing. Martin Kocian, Ing. Ondřej Krejza, Ing. Kristýna Jandová, Ing. Radek Lábus, Ing. Michal Macalík, Ing. Jaromír Makovička, Ing. Vilém Neděla, Ing. Tomáš Nováček, Ing. Jan Rychnovský, Ing. Vít Svoboda, Ing. Petr Špičák, Ing. Jiří Vognar, Ing. Jiří Vrbický

Administrative and Technical Staff

Jarmila Bartošková, Ing. Zdeněk Buřival, CSc., Ing. Petr Kahle, Věra Kittnerová, František Kořínek, Rudolf Krásenský, Dagmar Prosová, Ing. Miroslav Zatloukal

Main Interests

In 2008, 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.

Research was centred on basic and applied research of electrochemical sources of electric energy – lead-acid batteries, alcaline batteries and fuel cells (development of polymer membranes), renewable sources of electric energy in general and their exploitation in alternative transport in electric and hybrid vehicles, detection of signal electrons and methods of environmental scanning electron microscopy, gel electrolytes (increasing electric conductivity through presence of alumina nanoparticles) and their utilization in lithium-ion batteries (high efficiency of graphite as an anodic material) electrocatalysts, ion exchangers and thin-film electrodes for electrochromic systems, lead-free soldering and quality and reliability of soldered joints, and 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, ČAS-Service Znojmo, EPRONA a.s. Rokytnice n. Jizerou, ROTOKOV Křídlůvky u Znojma and ELMARCO Liberec. Within the framework of the programme KONTAKT the department cooperates with the institute INIFTA Universidad Nacionál de La Plata, Argentina.

In the focus of attention is the continuous upgrading of the specialization Electrotechnical Manufacturing and Management as well as upgrading of instruction laboratories for increased use of the computer rooms and library for instruction and self-study.

Major Achievements

The department organized the '9th International Conference Advanced Batteries and Accumulators' (A.B.A.-9) Brno. The department co-organized, in cooperation with the Czech Electrotechnical Society, group for chemical sources of electric energy (M. Calábek, P. Bača, P. Křivík), the 29th conference 'Non-Conventional Sources of Electric Energy', September 2008, Soběslav.

Representatives of the department participated in the regular meeting of institutes and departments of electrotechnology of Czech and Slovak technical universities in Terchová, held on the occasion of the conference Elektrotechnológia 2008, organized by the Department of Power Electrical Systems Faculty of Electrical Engineering, University of Žilina, September 2008 (Jiří Kazelle).

In June 2008 the department was visited by Prof. John R. Owen from the University of Southampton, School of Chemistry. On June 30 he presented the results of his work in the lectures „The Future of Lithium Batteries: Why We Need 3-D Nanostructures" and „Recent Progress in Lithium Electrochemistry".

In July, Prof. Petr Vanýsek from Northern Illinois University, Department of Chemistry and Biochemistry, USA lectured at the department on Interfacial Study of Immiscible Electrolyte Solutions Using X-ray Reflectivity" and „Impedance Measurements as a Measurement Tool in Electrochemistry".

In 2008, research at the department focused on the research plan Sources, Accumulation and Optimization of Energy Exploitation in Conditions of Permanently Sustainable Growth and on the international project ALABC C2.2 Significance of Carbon Additive in Negative Lead-Acid Battery Electrodes.

Major Research Projects

NMR Mobility and Conductivity of Ions in Gel Electrolytes – GA AV ČR KJB208130604
Investigator: Vítězslav Novák

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
Investigator: Milan Calábek

Motion and Accumulation of Ions in Polymer Ion Conductors– GAČR 104/06/1471
Investigator: Jiří Vondrák

Selected Publications

JIRÁK, T.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M. Insertion of Lithium into Nanosized Lithium Titanate. ECS Transactions, 2008, vol. 13, no. 1, pp. 87-94. ISSN: 1938-5862.

KREJZA, O.; VELICKÁ, J.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J. The presence of nanostructured Al_2O_3 in PMMA based gel electrolytes. Journal of Power Sources, 2008, vol. 178, no. 2, pp. 774-778. ISSN: 0378-7753.

MAKOVIČKA, J.; SEDLAŘÍKOVÁ, M.; VELICKÁ, J.; VONDRÁK, J. Expanded graphite as an intercalation anode material for lithium systems. Journal of Solid State Electrochemistry, 2008, vol. 2008, no. 10, pp. 662-666. ISSN: 1432-8488.

MAXA, J.; NEDĚLA, V. Selection of PDM Information System. Solid State Phenomena, 2008, vol. 15, no. 3, pp. 912-917. ISSN: 1662-9779.

NEDĚLA, V. Dynamical "in situ" observation of biological samples using variable pressure scanning electron microscope. Journal of Physics, 2008, in print.

REITER, J.; KREJZA, O.; SEDLAŘÍKOVÁ, M. Electrochromic devices employing methacrylate-based polymer electrolytes. Solar Energy Materials And Solar Cells, 2009, vol. 93, no. 2, pp. 249-255. ISSN: 0927-0248.

SEDLAŘÍKOVÁ, M.; DVOŘÁK, P.; VONDRÁK, J. The Voltammetry and Impedance of Porous Electrodes Correlated by Fourier Transform. In 213th ECS Meeting Phoenix ISSN: 1938-6737 online ISSN: 1938-5862 print. ECS Transactions (ECST). New Jersey USA: ECS, 2008. pp. 21-24.

ŠPIČÁK, P.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M.; SVOBODA, V.; KAZELLE, J. Coinsertion of Water and Hydrogen in Transition Metal Oxides and Hydroxides Studied by QCM. ECS Transactions, 2008, vol. 13, no. 1, pp. 87-92. ISSN: 1938-5862.

Bachelor Programme

Computer Projecting of Productions, Logistic and Ecology (Miroslav Cenek)

Design Systems of Printed Circuit Boards (Petr Bača)

Diagnostics and Testing (Josef Jirák)

Electrotechnical Materials and Production Processes (Jiří Kazelle)

Materials and Technical Documentation (Josef Jirák)

Printed Circuits and Surface Mount Technology (Jiří Starý)

Quality Management and Checking (Helena Polsterová)

Quality Management and Metrology (Helena Polsterová)

Reliability in Electrical Engineering (Helena Polsterová)

Special Diagnostics (Josef Jirák)

Master Programme

3D modelling (Jiří Maxa)

Alternative Energy Sources (Jiří Vaněk)

Climatotechnology in Electrical Engineering (Karel Liedermann)

Computers System for Projects (Vítězslav Novák)

Control and Data Administration (Jiří Maxa)

Design of Production Systems and Logistic (Jiří Špinka)

Diagnostic Methods in Electroengineering (Josef Jirák)

Ecology in Manufacturing (Miroslav Cenek)

Electroinsulation Systems (Helena Polsterová)

Fundamentals of Reliability in Electrical Engineering (Helena Polsterová)

Interconnection and Assembly Technology (Jiří Starý)

Materials for Biomedical Applications (Marie Sedlaříková)

Mechanical Desktop (Jiří Maxa)

Production Processes (Jiří Kazelle)

Reliability and Quality (Helena Polsterová)

Structure and Properties of Materials (Josef Jirák)

Technological Projecting and Logistic (Jiří Vaněk)

Doctoral Programme

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

Selected Diagnostic Methods, Reliability and Quality (Josef Jirák)

Laboratories

Library (access to electronic texts and instruction databases, a joint workplace shared with the department of Microelectronics, Petr Bača)

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 Sedlaříková)

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 alcaline accumulators (testing of alcaline 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 Jirák)

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 Sedlaříková)

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 Rozsívalová)

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, Milan Calábek)

Ion Laboratory (research, instruction and diploma theses in the field of measurement of air ions concentration, Zdeněk Buřival)

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, alcaline and cells with the ion-exchange membrane, study of electrochromic layers using liquid and polymer gel electrolytes Marie Sedlaříková)

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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Associate Professors

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Doc. Ing. Lubomír Grmela, CSc.
Doc. RNDr. Pavel Hruška, CSc.
Doc. RNDr. Milena Kheilová, CSc.
Doc. Ing. Pavel Koktavý, CSc., Ph.D.
Doc. Ing. Karel Liedermann, CSc.
Doc. Mgr. Jan Pavelka, CSc., Ph.D.
Doc. RNDr. Marian Štrunc, CSc.

Lecturers

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

Postgraduate Students

Ing. Inas Faisel Abuetwirat, Ing. Naděžda Bogatyreva, Ing. Miloš Chvátal, Ing. Jaroslav Kala, Ing. Alexandr Knápek, Ing. Robert Macků, Ing. Tomáš Palai-Dany, Ing. Petr Paračka, Ing. Jaromír Pelčák, Ing. Michal Raška, Ing. Pavel Škarvada, Ing. Pavel Tofel, Ing. Tomáš Trčka, Ing. Jiří Zajaček

Administrative and Technical Staff

Lenka Horká, Miroslav Sadovský, Ing. Petr Sadovský, Ph.D., 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 combined forms 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 were modified to meet the requirements of the new study area in the Doctoral degree programme Physical Electronics and Nanotechnology.

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

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 cooperates with European and Japanese laboratories in the field of noise spectroscopy and nanotechnology, extends cooperation with Augsburg University, Germany in research of dielectrics, and cooperates with the leading Czech laboratories in the development and enhancement of the parameters of CdTe radiation detectors.

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 2008, there were 92 publications, most of them in international journals and at world conferences.

Furthermore, the department dealt with nine grant projects GAČR, six grant projects FRVŠ, two projects KONTAKT and one project INGO in 2008. The projects GAČR 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 international project KONTAKT, whose chief investigator is J. Šikula, concentrates on the research on noise in biological and chemical substance detectors. Moreover, cooperation with the University of Missouri in St. Louis and Gdansk University, where the department can use their unique technology for experiments, was concluded within this project.

The Czech-American project KONTAKT, whose chief investigator is L. Grmela, focuses on increasing the efficiency and other parameters of CdTe radiation detectors. The project is investigated in cooperation with the University of Florida.

The international project INGO enables Prof. P. Tománek to be 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.

Five projects FRVŠ dealt with the upgrading of laboratories for tuition in the Bachelor and Master degree programmes.

The department managed to present the new study area of the Doctoral degree programme Physical Electronics and Nanotechnology to the Master students and stabilize the number of enrolled students.

Major Research Projects

Diagnostics of PN Components By Means of Microplasma Noise – GAČR 102/06/1551

102/06/1551
Investigator: Pavel Koktavý

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 Electro-Ultrasonic Spectroscopy of Thick Film Resistors – GAČR 102/07/P482

Investigator: Vlasta Sedláková Non-Linear Electroacoustic Spectroscopy in Solids – GAČR 102/06/0866
Investigator: Josef Šikula

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

Radiation Transport of Energy in Arc Plasma – GAČR 202/06/0898
Investigator: Milada Bartlová

Acoustic Emission Sensors for Temperatures up to 250°C – GAČR 102/08/P589
Investigator: Petr Sedlák

Selected Publications

AUBRECHT, V.; BARTLOVÁ, M. Net Emission Coefficients of Radiation in Air and SF_6 Thermal Plasmas. Plasma Chemistry and Plasma Processing, 2009, vol. 29, no. 2, pp. 131-147. ISSN: 0272-4324.

BARTLOVÁ, M.; AUBRECHT, V. Approximate Calculations of Continuous Spectra of Diatomic Molecules. Chemické listy, 2008,vol. 102, no. 16, p. 1341 (6 pp.)ISSN: 0009-2770.

HASSE, L.; SPIRALSKI, L.; SEDLÁKOVÁ, V.; ŠIKULA, J. Spektroskopia elektro-ultradzwiekowa warystorów wysokonapieciowych. Pomiary Automatyka Kontrola, 2008,vol. 54, no. 3, pp. 2-4. ISSN: 0032-4140.

HOLCMAN, V.; LIEDERMANN, K. New mixing rule of polymer composite systems. WSEAS Transactions on Electronics, 2008, vol. 4, no. 1, pp. 181-185. ISSN: 1109-9445.

KOKTAVÝ, P. Experimental study of electromagnetic emission signals generated by crack generation in composite materials. Measurement Science and Technology, 2008, vol. 20, no. 1, pp. 0-7. ISSN: 0957-0233.

KOKTAVÝ, P.; MACKŮ, R.; PARAČKA, P.; KRČÁL, O. Microplasma noise as a tool for PN junctions diagnostics. WSEAS Transactions on Electronics, 2008, vol. 4, no. 9, pp. 186-191. ISSN: 1109-9445.

MACKŮ, R.; GRMELA, L.; TOMÁNEK, P. Near-field measurement of ZnS:Mn nanocrystal and bulk thin-film electroluminescent devices. Journal of Microscopy, 2008, vol. 229, no. 2, pp. 275-280. ISSN: 0022-2720.

MACKŮ, R.; KOKTAVÝ, P.; ŠKARVADA, P. Advanced non-destructive diagnostics of monocrystalline silicon solar cells. WSEAS Transactions on Electronics, 2008, vol. 4, no. 9, pp. 192-197. ISSN: 1109-9445.

PAVELKA, J.; ŠIKULA, J.; TACANO, M. RTS Noise in Si MOSFETs and GaN/AlGaN HFETs. WSEAS Transactions on Electronics, 2008, vol. 4, no. 9, pp. 221-225. ISSN: 1109-9445.

PAVELKA, J.; TANUMA, N.; TACANO, M.; ŠIKULA, J. Noise Spectroscopy of GaN/AlGaN HFETs. WSEAS Transactions on Electronics, 2008, vol. 4, no. 9, pp. 198-201. ISSN: 1109-9445.

RAŠKA, M.; KOKTAVÝ, P. Application of Microplasma Noise Statistical Characteristics to Studying the PN Junction Heating in the Neighbourhood of Local Defects. WSEAS Transactions on Electronics, 2008, vol. 4, no. 1, pp. 202-207. ISSN: 1109-9445.

SEDLÁK, P.; ŠIKULA, J.; LOKAJÍČEK T.; MORI Y. Acoustic and electromagnetic emission as a tool for crack localization. Measurement Science and Technology, 2008, vol. 19, no. 4, pp. 0-6. ISSN: 0957-0233.

SEDLÁKOVÁ, V.; ŠIKULA, J.; TOFEL, P.; MAJZNER, J. Electro-ultrasonic spectroscopy of polymer-based thick film layers. Microelectronics Reliability, 2008, vol. 48, no. 6, pp. 886-889. ISSN: 0026-2714.

SEDLÁKOVÁ, V.; TOFEL, P.; ŠIKULA, J.; TACANO, M. Noise, Non-Linearity and Electro-Ultrasonic Spectroscopy for Testing of Resistors. Passive Component Industry Magazine, 2008, vol. 2008 (10), no. 6, pp. 23-27.

ŠTRUNC, M. Constitutive relations and conditions for reciprocity in bianisotropic media. (Macroscopic approach). WSEAS Transactions on Electronics, 2008, vol. 4, no. 9, pp. 208-212. ISSN: 1109-9445.

ŠTRUNC, M. Reciprocity principle in bianisotropic composite media. (Microscopic approach). WSEAS Transactions on Electronics, 2008, vol. 4, no. 9, pp. 213-217. ISSN: 1109-9445.

Bachelor Programme

Physics 1 (Pavel Dobis)

Physics 2 (Milada Bartlová)

Seminar of Physics (Eva Hradilová)

Master Programme

Modern Physics (Milena Kheilová)

Nanotechnology (Pavel Tománek)

Non-Destructive Diagnostics and Physics of Dielectrics (Karel Liedermann)

Solid State Physics (Lubomír Grmela)

Doctoral Programme

Junctions and Nanostructures (Pavel Tománek)

Spectroscopic Methods for Non-Destructive Diagnostics (Karel Liedermann)

Laboratories

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

Laboratory of Dielectric 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)

Department of Languages

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Administrative and Technical Staff

Miroslava Purová, Hana Vondráčková

Main Interests

The department provides language courses and courses concerning social sciences for the students at the Faculty of Electrical Engineering and Communication and other faculties. In 2008, it paid close attention to innovation of electronic course materials, which are used in class together with multimedia and are available to the students for self-study. Social science courses are also supplemented with new course texts. Powerpoint presentations describing grammar and cultural differences between the Czech Republic and English speaking countries, especially Great Britain, USA and Canada, German speaking countries and other countries of the European Union were made. A classroom was equipped with multimedia and now there are six classrooms with such modern equipment in the Department of Languages. Electronic materials for self-study are also available to part-time students.

Courses provided by the Department of Languages are attended by more than 3 000 students from three faculties of Brno University of Technology (Faculty of Electrical Engineering and Communication, Faculty of Information Technology and Faculty of Business and Management) every year. The courses always respect the particular needs of students in both the level and content. New requirements were introduced for the students of the Master degree programme and they have to study another foreign language in addition to English. As a result, all language courses offered to Master students were innovated.

As far as research is concerned, the department deals with a professional variety of English for electrical engineering. We focus especially on the pragmatic meaning of technical texts based on professional knowledge of its users, technical terms, their formation and use in Czech technical texts. Lexical cohesion and coherence of technical texts are also the focus of our research. Furthermore, we are concerned with the variety of English as a language of international understanding – English as a Lingua Franca. We apply the results of our research in class. Multimedia teaching methods and professional standards of English for Electrical Engineering are another field of our interest. The department staff present their research results at international conferences and in international publications.

Major Achievements

Krhutová, M. Pragmatic Aspects of English for Engineering, In W. Aung, J. Mesci, J. Moscinski, I. Rouse, P. Willmot (Eds.) Conference on World Innovations in Engineering Education and Research, Arlington USA.

Neuwirthová, L. Constructing a Foreign Language Standard for Technically-Oriented Universities. Conference on World Innovations in Engineering Education and Research. Arlington USA.

BORECKÁ, M. Teaching English and Spanish for General and Specific Purposes to Engineering Students. 11th International Conference on Ambiguity and the Search for Meaning: English and American Studies at the Beginning of the 21st Century. Krakow, Poland.

Smutný, M. English Compound Substantives and Their Czech Equivalents. 11th International Conference on Ambiguity and the Search for Meaning: English and American Studies at the Beginning of the 21st Century. Krakow, Poland.

Sedláček, P. Multicultural Canadian Cities. 4th International Summer School Europe and Canada: Contemporary Issues. Maribor, Slovenia, June 28 – July 12, 2008.

Krhutová, M., Neuwirthová, L. Research plan MSM 0021630503 New Trends in Microelectronic Systems and Nanotechnologies (MIKROSYN), language support, investigator Radimír Vrba.

Selected Publications

KRHUTOVÁ, M. Pragmatic Aspects of English for Engineering. In INNOVATIONS 2008: World Innovations in Engineering Education and Research. iNEER Innovations Series. Arlington, VA 22205, USA: Begell House Publishing, 2008. pp. 100-113. ISBN: 978-0-9741252-8-2.

NEUWIRTHOVÁ, L. Constructing a Foreign Language Standard for Technically-Oriented Universities. In INNOVATIONS 2008: World Innovations in Engineering Education and Research. iNEER Innovations Series. Arlington, VA 22205, USA: Begell House Publishing, 2008. pp. 57-61. ISBN: 978-0-9741252-8-2.

NEUWIRTHOVÁ, L. Tvorba standardu cizojazyčného vzdělávání pro vysoké školy technického zaměření. Pedagogika, 2008, vol. LVIII, no. 4, pp. 350-368. ISSN 0031-3815.

SEDLÁČEK, P. Divergence of Canadian and American Cities. American and British Studies Annual, 2008, vol. 1, no. 1, pp. 51-58. ISSN: 1803-6058.

SMUTNÝ, M. Czech Equivalents of English Compounds. In the international volume Discourse and Interaction, vol. 1, no. 2, pp. 99-108. Brno: Masaryk University, Pedagogical Faculty. ISSN 1802-9930.

Bachelor Programme

Bookkeeping for Managers (Martin Jílek)

Business English (Dagmar Malíková)

Culture of Speech and the Generation of Texts (Petra Fiĺová)

Double-Entry Bookkeeping (Martin Jílek)

Engineering Pedagogy and Didactics (Helena Pálková)

English – Effective Reading of English text (Marcela Borecká)

English for Bachelors- Intermediate 1 (Petra Langerová)

English for Bachelors- Intermediate 2 (Jaroslav Trávníček)

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

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

English for Europe (Přemysl Dohnal)

Ethics in Making the Business (Martin Jílek)

German for Beginners (Ladislav Baumgartner)

German for Intermediate Students I. (Ladislav Baumgartner)

German for Lower-Intermediate (Ladislav Baumgartner)

Laboratory Didactic (Martin Jílek)

Pedagogical Psychology (Věra Pražáková)

Present Philosophy - Postmodernism (Milan Klapetek)

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

Reading Skills (Marcela Borecká)

Russian for Beginners (Alena Baumgartnerová)

Russian Pre-Intermediate (Alena Baumgartnerová)Spanish for Lower-Intermediate Students (Marcela Borecká)

Spanish for Beginners (Marcela Borecká)

Master Programme

Bookkeeping for Managers (Martin Jílek)

Business English (Dagmar Malíková)

Culture of Speech and the Generation of Texts (Petra Filová)

Double-Entry Bookkeeping (Martin Jílek)

English – Effective Reading of English text (Marcela Borecká)

English for Europe (Přemysl Dohnal)

English for Intermediate Students (Přemysl Dohnal)

English for Upper-Intermediate Students (Kenneth Froehling)

Ethics in Making the Business (Martin Jílek)

German for Beginners (Ladislav Baumgartner)

German for Intermediate Students I. (Ladislav Baumgartner)

German for Lower-Intermediate (Ladislav Baumgartner)

History and Philosophy of Technology (Milan Klapetek)

Present Philosophy - Postmodernism (Milan Klapetek)

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

Doctoral Programme

English for post-graduates (Dagmar Malíková)

Russian for Beginners (Alena Baumgartnerová)

Russian Pre-Intermediate (Alena Baumgartnerová)

Spanish for Beginners (Marcela Borecká)

Spanish for Lower-Intermediate Students (Marcela Borecká)

Department of Mathematics

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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

RNDr. Lubomír Bajgar, 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

Postgraduate Students

Ing. Olga Filippova, Mgr. Vladislav Biba, Mgr. Blanka Morávková

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 is focused mainly on the study of discrete and differential equations, description of the asymptotic behaviour of a solution and controllability of given systems. Also studied are actions of semihypergroups and hypergroups of linear differential operators, standard and partial, including the Fredholm integral operators in the area of smooth functions used as a basis for construction of automatrix. Structured systems (binary multistructures) of preference relationships and Kripke transformation, functional equations of one variable with selected cores in the form of elementary functions and their solubility. Estimates for solutions of hybrid systems described by scalar neutral equations. For the systems of the so called oscillatoric second-order differential equations with constant coefficients, optimal forms of control functions are created by means of special matrix functions. Also studied are integro-differential equations with confined delay with respect to analysis of non-linear electric circuits with initial memory. Study of the Choquet integral, fuzzy preference structures, their characteristics, application in the multicriterial decision-making process, and particularly modelling of criteria interaction. In the above research, the department closely cooperates with mathematical departments of technical universities in Klagenfurt, Kiiv, Udine, Negev (Israel) and Žilina.

Major Achievements

The department was involved in solution of 3 GAČR projects and 2 FRVŠ projects. The department members participated in the research plans MSM0021630503 New Trends in Microelectronic Systems (MIKROSYN) and MSM0012630529 Intelligent Systems in Automation.

The department has maintained direct cooperation with international institutions. In 2008, the department was visited by notable world experts Prof. D. Khusainov, Kiev, Prof. S. A. Dolenko, Kiev, Prof. L. Berezansky, Israel).

The main areas of interest were estimates for solutions of hybrid systems described at each interval by neutral differential equations with feedback and asymptotics of the solution of the discrete equation of the Emden-Fowler type describing nano-effects. Also studied were synoptic forms of control functions for systems of second-order linear differential equations describing oscillatoric effects in circuits. Some of these results were accepted for publication in impact journals Discrete Mathematics and Nonlinear Analysis Series A: Theory, Methods & Applications. There were 21 papers published in international reviewed journals. The staff of the department coorganized the following international conferences: Sixth International Mathematical Workshop 16 October 2008, Brno and XXVI. International Colloquium on Education Process, 15 May 2008, Brno.

In the recently accredited doctoral degree programme Mathematics in Electrical Engineering, two full-time and two part-time students started their postgraduate studies at the department.

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

Selected Publications

ANASHKIN, O.; DIBLÍK, J. On stability of difference equations with delay. Dynamical Systems, 2008,vol. 23, no. 1, pp. 113-122. ISSN: 0203-3755.

BAŠTINEC, J.; DIBLÍK, J.; HLAVIČKOVÁ, I. Inequalities for a class of positive solutions of discrete equations of discrete equation Delta u(n+k)=-p(n)u(n) in the critical case. International Journal of Pure and Applied Mathematics, 2008, vol. 41, no. 4, pp. 539-548. ISSN: 1311-1728.

BAŠTINEC, J.; DIBLÍK, J.; ŠMARDA, Z. Positive solutions of delayed discrete equations. International Journal of Pure and Applied Mathematics, 2008, vol. 41, no. 4, pp. 529-538. ISSN: 1311-1728.

DIBLÍK, J.; KHUSAINOV, D.; GRYTSAY, I. Stability investigation of nonlinear quadratic discrete dynamics systems in the critical case. Journal of Physics: Conference Series, 2008, vol. 96, no. 1, pp. 1-6. ISSN: 1742-6596.

DIBLÍK, J.; KHUSAINOV, D.; RŮŽIČKOVÁ, M. Controllability of linear discrete systems with constant coefficients and pure delay. SIAM Journal on Control And Optimization, 2008, vol. 47(2008), no. 3, pp. 1140-1149. ISSN: 0363-0129.

DIBLÍK, J.; SVOBODA, Z.; ŠMARDA, Z. Explicit Criteria for Existence of Positive Solutions for a Scalar Differential Equations with Variable Delay in Critical Case. IF=0,72. Computers and Mathematics with Applications, 2008, vol. 56(2008), no. 1, pp. 556-564. ISSN: 0898-1221.

DIBLÍK, J.; ŠMARDA, Z.; RŮŽIČKOVÁ, M. Bounded solutions of systems of dynamic equations on time scales. Communications of the Laufen colloquium on science, 2008, vol. 4, no. 1, pp. 1-12. ISSN: 0945-0882.

HLINĚNÁ, D.; KRÁĽ, P.; KALINA, M. Choquet integral with respect to Lukasiewicz filters, and its modifications. INFORMATION SCIENCES, 2009, vol. 179, (20 pp.)ISSN: 0020-0255.

HOŠKOVÁ, Š.; CHVALINA, J. Discrete transformation hypergroups and transformation hypergroups with phase tolerance space. DISCRETE MATHEMATICS, 2008, vol. 2008, no. 308, pp. 4133-4143. ISSN: 0012-365X.

HOŠKOVÁ, Š.; CHVALINA, J.; RAČKOVÁ, P. Transposition hypergroups of Fredholm integral operators and related hyperstructures II. Journal of Basic Science, 2008, vol. 4(2008), no.1, pp. 55-70. ISSN: 1735-0611.

HOŠKOVÁ, Š.; CHVALINA, J.; RAČKOVÁ, P. Transposition hypergroups of Fredholm integral operators and related hyperstructures I. Journal of Basic Science, 2008, vol. 4(2008), no. 1, pp. 43-54. ISSN: 1735-0611.

KOVÁR, M. Mutually compactificable topological spaces. International Journal of Mathematics and Mathematical Sciences, 2008, vol. 2007, no. Article ID 67083, pp. 1-10. ISSN: 0161-1712.

KOVÁR, M. The classes of mutual compactificability. International Journal of Mathematics and Mathematical Sciences, 2008, vol. 2007, no. Article ID 67083, pp. 1-11. ISSN: 0161-1712.

NOVÁK, M. Programming one's own stand-alone teaching aids for students of mathematical subjects. Problems of Education in the 21st Century, 2008, vol. 2008, no. 5, pp. 105-112. ISSN: 1822-7864.

ŠMARDA, Z. Modification of Wazewki's theorem for integrodiffrential equations. International Journal of Pure and Applied Mathematics, 2008, vol. 41, no. 4, pp. 519-527. ISSN: 1311-1728.

Bachelor Programme

Mathematical Seminar (Petr Fuchs)

Mathematics 1 (Vlasta Krupková)

Mathematics 2 (Jan Chvalina)

Mathematics 3 (Břetislav Fajmon)

Selected Parts from Mathematics (Zdeněk Šmarda)

Master Programme

Differential Equations in Electrical Engineering (Josef Diblík)

Matrices and Tensors Calculus (Martin Kovár)

Matrix Calculus (Martin Kovár)

Modern Numerical Methods (Jaromír Baštinec)

Probability, Statistics, Operations Research (Jaromír Baštinec)

Doctoral 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 by means of the Matlab, Maple and Mathematica, Lubomír Bajgar)

Department of Microelectronics

Prof. Ing. Vladislav Musil, CSc.

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Prof. Ing. Radimír Vrba, CSc.

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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.

Lecturers

Ing. Martin Adámek, Ph.D., Ing. Daniel Bečvář, Ph.D., Ing. Lukáš Fujcik, Ph.D., Ing. Jiří Háze, Ph.D., Ing. Edita Hejátková, RNDr. Michal Horák, CSc., Ing. Jaroslav Kadlec, Ph.D., Ing. et Ing. Fabián Khateb, Ph.D., Ing. Radek Kuchta, Ph.D., Ing. Radovan Novotný, Ph.D., Ing. Jan Prášek, Ph.D., Ing. Roman Prokop, Ing. Milan Recman, CSc., Ing. Ondřej Sajdl, Ph.D., Ing. Jiří Stehlík, Ing. Josef Šandera, Ph.D., Ing. Pavel Šteffan, Ph.D.

Postgraduate Staff

Ing. Petr Běťák, Ing. Marek Bohrn, Ing. Tomáš Brich, Ing. Issa El Dbib, Ing. Richard Ficek, Ing. Tomáš Fořt, Ing. Tomáš Havlíček, Ing. Ondřej Hégr, Ing. Radek Helán, Ing. Jiří Hladík, Ing. Radim Hrdý, Ing. R.H. Ben Ayad Ibrahim, Ing. Petr Kosina, Ing. Martin Laža, Ing. Anar Mammadov, Ing. Feras Moualla, Ing. Kamil Nováček, Ing. Marek Novotný, Ing. Vít Ondruch, Ing. Michal Pavlík, Ing. Olga Švecová, Ing. Mahmoud Shaktour, Ing. Assaid Sharon, Ing. Viktor Švéda, Ing. Jan Vaněk, Ing. Cyril Vaško, Ing. Jiří Vávra

Administrative and Technical Staff

Ing. Jan Břínek, Jarmila Fučíková, Ing. Petr Hub, Petra Jedličková, Hana Jelínková, PhDr. Jarmila Jurášová, Ing. Kateřina Klosová, Ing. Zdeněk Kozáček, Ing. Martin Magát, Ing. Břetislav Mikel, Ph.D., Bc. David Nejezchleb, Vladislav Pliska, Ing. Marek Šimčák, Ph.D.

Main Interests

The department provides instruction in basic subjects, mainly 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 programmes.

Research is centred on basic and applied research of integrated circuits and sensors using micro- and nanotechnologies. The main areas of interest are 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 cooperates (placements of students) with KHBO Oostende, Belgium and Technical University of Sofia, Bulgaria, and has made research contacts with the company CEDO in Brno, Autoflug in Hamburg, Catalania University Rovira and Virgili in Tarragona, the research laboratory IMEC-KHBO in Belgium, Yeditepe University Istanbul and King Mongkut's Institute of Technology North Bangkok. In cooperation with Yeditepe University Istanbul novel topologies of the element CDTA in the technology CMOS 0.35um are being developed.

Major Achievements

In 2008, members of the department were involved in 2 projects of the 5th FP EU, in 4 GAČR projects, 2 projects of Academy of Sciences, 17 FRVŠ projects, 4 projects of cooperation with industry, Ministry of Industry and Trade, 2 NPV II projects and 1 project of Academy of Sciences.

In September 2007, the department organized the international conference 'Electronic Devices and Systems EDS2008' with the participation of Czech and foreign experts. There were 95 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 focused on ecological design of electronic products and the process of cleaning, thermal stress modelling in solder joints and cases, including bonding and modelling connections for semiconductor chips. Work on the unique thermal balance sensor continued. Novel preparations and facilities, e.g. for deposition of thick films and the LTCC technology are developed. These activities were awarded by the organization of the reputable international conference ISSE 2009 in Brno.

The group of electrochemical sensors, led by Jaromír Hubálek, tested a new unique system for electrochemical analysis, which was published in the impact journal Sensors. In the use of nanotechnology in construction of electrochemical sensors, members of the research team achieved first positive results published in the journal Physica Status Solidi.

The group led by Jaroslav Boušek elaborated a method for hydrogen sensors assessment and published their results in the impact journal International Journal of Hydrogen Energy.

Prof. D. Biolek led experiments with the CDTA chip (Current Differencing Transconductance Amplifier), made in Belgium in the previous stage of research. Detailed characterization of the CDTA was performed and on the basis of the measured data a unique SPICE model of the CDTA was compiled. It was subsequently used to design a quadrature oscillator developed in cooperation with King Mongkut's University of Technology North Bangkok, Thailand. This cooperation led to the design of a second-order universal filter with a current conveyor. The principal outcome of the research of novel circuit elements is a voluminous publication in the impact journal Radioengineering, elaborated in cooperation with Prof. R. Senani, a world known expert in electronic circuits, the director of NSIT (Netaji Subhas Institute of Technology), New Delhi, India. The publication presents a detailed analysis of the state-of-the-art in research of active electronic elements with focus on the current mode. A special methodology was used to design a wide range of novel circuit principles.

Major Research Projects

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

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

Micro- and Nano- Sensoric Structures and Systems with Embedded Intelligence – GAČR 102/06/1624
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

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

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

Research and Development of Machinery for Surface and Volume Forming – MPO FT-TA2/101
Investigator: Radimír Vrba

Selected Publications

ADAM, V.; ZÍTKA, O.; DOLEŽAL, P.; ZEMAN, L.; HORNA, A.; HUBÁLEK, J.; ŠÍLENÝ, J.; KŘÍŽKOVÁ, S.; TRNKOVÁ, L.; KIZEK, R. Lactoferrin Isolation Using Monolithic Column Coupled with Spectrometric or Micro-Amperometric Detector. SENSORS, 2008, vol. 2008, no. 8, pp. 464-486. ISSN: 1424-8220.

ADÁMEK, M.; PRÁŠEK, J.; RŮŽIČKA, T. The Topology Design of Thick-Film Electrochemical Sensor Array. Electronics, 2008, vol. 17, no. 1, pp. 92-96. ISSN: 1313-1842.

ADÁMEK, M.; PRÁŠEK, J.; RŮŽIČKA, T. The Two and Three Electrodes Systems Topology Optimisation of Electrochemical Sensors. Electronics, 2008, vol. 17, no. 1, pp. 87-91. ISSN: 1313-1842.

BĚŤÁK, P.; MUSIL, V. Snap-back characteristics tuning of SCR-based semiconductor structures. WSEAS Transactions on Electronics, 2008, vol. 4, no. 9, pp. 175-180. ISSN: 1109-9445.

BĚŤÁK, P.; MUSIL, V. Variable Lateral Silicon Controlled Rectifier as an ESD Protection. WSEAS Transactions on Electronics, 2008, vol. 5, no. 8, pp. 350-359. ISSN: 1109-9445.

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.

BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z. Universal Current-Mode OTA-C KHN Biquad. International Journal of Electronics, Circuits and Systems (IJECS), 2008vol. 1, no. 4, pp. 214-217. ISSN: 1307-4156.

BIOLEK, D.; KADLEC, J.; BIOLKOVÁ, V.; KOLKA, Z. Interactive Command Language for OrCAD PSpice via Simulation Manager and its Utilization for Special Simulations in Electrical Engineering. WSEAS Transactions on Electronics, 2008, vol. 5, no. 5, pp. 186-195. ISSN: 1109-9445.

BIOLEK, D.; SENANI, R.; BIOLKOVÁ, V.; KOLKA, Z. Active Elements for Analog Signal Processing: Active Elements for Analog Signal Processing: Classification, Review, and New Proposals. Radioengineering, 2008, vol. 17, no. 4, pp. 15-32. ISSN: 1210-2512.

BOUŠEK, J. Reliability of commercially available hydrogen sensors for detection of hydrogen at critical concentrations: Part II selected sensor test results. International Journal of Hydrogen Energy, 2009, vol. 2008, no. 1, pp. 562-571. ISSN: 0360-3199.

BOUŠEK, J.; SALYK, O. Reliability of commercially available hydrogen sensors for detection of hydrogen at critical concentrations: Part I Testing facility and methodologies. International Journal of Hydrogen Energy, 2008, vol. 2008, no. 1, pp. 7648-7657. ISSN: 0360-3199.

DIOPAN, V.; BABULA, P.; SHESTIVSKA, V.; ADAM, V.; ŽEMLIČKA, M.; DVORSKÁ, M.; HUBÁLEK, J.; TRNKOVÁ, L.; HAVEL, L.; KIZEK, R. Electrochemical and spectrometric study of antioxidant activity of pomiferin, isopomiferin, osajin and catalposide. Journal of Pharmaceutical And Biomedical Analysis, 2008, vol. 2008, no. 48, pp. 127-133. ISSN: 0731-7085.

DRBOHLAVOVÁ, J.; ADAM, V.; KIZEK, R.; HUBÁLEK, J. Quantum Dots - Characterization, Preparation and Usage in Biological Systems. International Journal of Molecular Sciences, 2009, vol. 2009 (10), no. 2, pp. 656-673. ISSN: 1422-0067.

FABRIK, I.; KŘÍŽKOVÁ, S.; HUŠKA, D.; ADAM, V.; HUBÁLEK, J.; TRNKOVÁ, L.; PRŮŠA, R.; KIZEK, R. Employment of Electrochemical Techniques for Metallothionein Determination in Tumor Cell Lines and Patients with a Tumor Disease. Electroanalysis, 2008, vol. 20, no. 14, pp. 1521-1531. ISSN: 1040-0397.

FUJCIK, L.; PROKOP, R. Design of Harmonic Signal Generator for Capacitive Pressure Sensor Measurement. Electronics, 2008, vol. 2008, no. 3, pp. 29-34. ISSN: 1313-1842.

JAIKLA, W.; SIRIPRUCHYANUN, M.; BAJER, J.; BIOLEK, D. A Simple Current-Mode Quadrature Oscillator Using Single CDTA. Radioengineering, 2008, vol. 17, no. 4, pp. 33-40. ISSN: 1210-2512.

KLOSOVÁ, K.; HUBÁLEK, J. Advanced electrodes with nanostructured surfaces for electrochemical microsensors. physica status solidi, 2008, vol. 205, no. 6, pp. 1435-1438. ISSN: 0031-8965.

KOSINA, P.; ADÁMEK, M.; ŠANDERA, J. Micro-channel in LTCC. Electronics, 2008, vol. 2008, no. 1, pp. 109-114. ISSN: 1313-1842.

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KŘÍŽKOVÁ, S.; RYANT, P.; KRYŠTOFOVÁ, O.; ADAM, V.; GALIOVÁ, M.; BEKLOVÁ, M.; BABULA, P.; KAISER, J.; NOVOTNÝ, K.; NOVOTNÝ, J.; LIŠKA, M.; MALINA, R.; ZEHNÁLEK, J.; HUBÁLEK, J.; HAVEL, L.; KIZEK, R. Multi-instrumental Analysis of Tissues of Sunflower Plants Treated with Silver(I) Ions - Plants as Bioindicators of Environmental Pollution. Sensors, 2008, no. 8, pp. 445-462. ISSN: 1424-8220.

PAVLÍK, M.; VRBA, R.; HÁZE, J. New Trends in Evaluation of the Sensors Output. In Robotics, Automation and Control. 1. Croatia: I-tech, 2008. pp. 307-318. ISBN: 978-953-7619-18-3.

PRÁŠEK, J.; ADÁMEK, M.; KŘIVKA, J. Materials for construction of planar reference electrodes of thick-film electrochemical sensors. Electronics, 2008, vol. 17, no. 4, pp. 97-102. ISSN: 1313-1842.

PRÁŠEK, J.; ADÁMEK, M.; PYTLÍČEK, Z. Optimization of electrochemical analytical device for measurements with thick-film electrochemical sensors. Electronics, 2008, vol. 17, no. 4, pp. 103-108. ISSN: 1313-1842.

PRÁŠEK, J.; HUBÁLEK, J.; ADÁMEK, M.; JAŠEK, O.; ZAJÍČKOVÁ, L. Nanopatterned working electrode with carbon nanotubes improving electrochemical sensors. Proceedings of the Institution of Mechanical Engineers, Part N: Journal of Nanoengineering and Nanosystems, 2008, no. 221, pp. 115-119. ISSN: 1740-3499.

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TRNKOVÁ, L.; ADAM, V.; HUBÁLEK, J.; BABULA, P.; KIZEK, R. Amperometric Sensor for Detection of Chloride Ions. Sensors, 2008, vol. 2008, no. 8, pp. 5619-5636. ISSN: 1424-8220.

Bachelor Programme

Analogue Electronic Circuits (Dalibor Biolek)

Design and Technology of Electronic Instruments (Vladislav Musil)

Design of Analog Integrated Circuits (Daniel Bečvář)

Diagnostics and Testing of Electronic Systems (Milan Recman)

Digital Circuits and Microprocessors (Radimír Vrba)

Electronic Devices (Jaroslav Boušek)

Electrovacuum Instruments and Cryogenic Technique (Jaroslav Boušek)

Management Minimum (Pavel Legát)

Microelectronic Practicals (Josef Šandera)

Microelectronics and Assembly Technology (Ivan Szendiuch)

Microsensors and Micromechanical Systems (Radimír Vrba)

Modelling and Computer Simulation (Dalibor Biolek)

Optoelectronics and Optical Communications (František Urban)

VLSI Digital IC Design and VHDL (Daniel Bečvář)

Master Programme

Analogue Integrated Circuits (Jiří Háze)

Applied Computer Technology (Radovan Novotný)

Design and Technology of Electronic Equipments (Vladislav Musil)

Design of Analogue CMOS Circuits (Vladislav Musil)

Design of Digital CMOS Circuits (Vladislav Musil)

Design of Electronic Instruments (Radimír Vrba)

Digital Integrated Circuits (Vladislav Musil)

Electronic Components Production (Ivan Szendiuch)

Integrated Optoelectronics (František Urban)

Management Minimum (Pavel Legát)

Methods of Analog Integrated Circuits Design (Vladislav Musil)

Methods of Digital Integrated Circuits Design (Vladislav Musil)

Microelectronic Devices and Structures (Michal Horák)

Microelectronics Circuits (Daniel Bečvář)

Microelectronics in English (Jaromír Brzobohatý)

Modelling and Simulation in Microelectronics (Dalibor Biolek)

New Circuit Principles for Integrated System design (Jaromír Brzobohatý)

New Technology for Microelectronic Circuits (Ivan Szendiuch)

PC Technology and Communication (Jaromír Hubálek)

Quality Control (Radovan Novotný)

Technological Process Control (Radovan Novotný)

Theory of AD and DA Signal Conversion (Radimír Vrba)

Vacuum Technology (Jaroslav Boušek)

Postgraduate Students

Microelectronic Systems (Vladislav Musil)

Microelectronic Technology (Jaromír Hubálek)

Laboratories

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

Laboratory of Microsensors and Nanotechnologies (research laboratory, 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 (instruction in Microsensors and Microelectromechanical Systems, Jaromír Hubálek, Vacuum Technology and Cryotechnology, 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)

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

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

Laboratory of Instrument Technology (research and development laboratory, Jaroslav Boušek, Josef Šandera, Jaromír Hubálek)

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

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Prof. Ing. Václav Říčný, CSc.
Prof. Ing. Milan Sigmund, CSc.
Prof. Ing. Jiří Svačina, CSc.
Prof. Ing. Vladimír Šebesta, CSc.
Prof. Ing. Otakar Wilfert, CSc.

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Doc. Ing. Jaromír Kolouch, CSc.
Doc. Ing. Roman Maršálek, Ph.D.
Doc. Ing. Zdeněk Nováček, CSc.
Doc. Ing. Aleš Prokeš, Ph.D.

Lecturers

Ing. Viera Biolková, Ing. Jiří Dřínovský, Ph.D., Ing. Zbyněk Fedra, Ph.D., Ing. Tomáš Frýza, Ph.D., Ing. Ivana Jakubová, Ing. Tomáš Kratochvíl, Ph.D., Ing. Jaroslav Láčík, Ph.D., Ing. Zbyněk Lukeš, Ph.D., Ing. Václav Michálek, CSc., Ing. Jiří Petržela, Ph.D., Ing. Jan Prokopec, Ph.D., Ing. Martin Slanina, Ph.D. Ing. Jiří Šebesta, Ph.D., Ing. Tomáš Urbanec

Postgraduate Students

Ing. Filip Adamec, Ing. Ondřej Baran, Ing. Marek Bobula, Ing. Jan Diblík, Ing. Ondřej Dvořák, Ing. Radek Dvořák, Ing. Lukáš Džbánek, Ing. Jakub Džubera, Ing. Michal Fuchs, Ing. Martin Hampl, Ing. Jiří Hermany, Ing. Jiří Horák, Ing. Petr Kejík, Ing. Peter Kovács, Ing. Michal Kováč, Ing. Jan Kovář, Ing. Martin Kravka, Ing. Petr Křivák, Ing. Michal Kubíček, Ing. Petr Kučera, Ing. Radek Kvíčala, Ing. Lukáš Oliva, Ing. Petr Orság, Ing. Ondřej Pirochta, Ing. Václav Pospíšil, Ing. Karel Povalač, Ing. Jan Puskely, Ing. Jaroslav Rumánek, Ing. Zdeněk Řezníček, Ing. Pavel Sala, Ing. Josef Slezák, Ing. Vladimír Smejkal, Ing. Michal Strýček, Ing. Tomáš Sutorý, Ing. Radek Šebela, Ing. Roman Šotner, Ing. Jiří Špaček, Ing. Radim Štukavec, Ing. Petr Tošovský, Ing. Josef Urban, Ing. Václav Valenta, Ing. Michal Vavrda, Ing. Rostislav Vídenka, Ing. Pavel Vyskočil, Ing. Petr Zelinka

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Ing. Lucie Dordová, Ing. Martin Horák, Ph.D., Ing. Jana Jilková, Ing. Michal Pokorný, Dora Šebestová, Petra Šípová, Ing. Martin Štumpf, Ing. Petr Vágner, Ph.D., 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, projects of the National Research Programme II, Research Centre, GAČR projects (6 standard, 4 postdoctoral and 2 doctoral grant programmes) and GAAV projects (1 junior research grants). The department participates in projects of the Czech Ministry of Industry and Trade and projects for the National Security Office.

Research results are reflected in instruction in Bachelor, Master and doctoral study programmes. Updating and modernization of education are financed from 19 FRVŠ research projects.

Education is also supported by the cooperating companies (competition Freescale Technology Application, Freescale Race Challenge, organizing of Radioelectronics seminars, topics for Bachelor and Master projects).

The department also offers special training courses for cooperating companies (e.g. Škoda Auto and Foxconn).

The department cooperates with many professional and other organizations. Lubomír Brančík is the chairman of the Czech-Slovak section of IEEE. Within the framework of the National Research Programme II, the activates of Radioclub OK2KOJ and of the IEEE student branch at BUT are supported. The department staff are active members of the Czech Electrotechnical Society. The department is a collective member of the International Organization AMSAT.

Major Achievements

In 2008, the department achieved original results in the research of planar microwave structures (publication in Microwave and Optical Technology Letters). The low-pass filter design method was described as well as the circuit substitute models and transition from substitute circuits to the planar structure.

Members of the department had patented the multiband speckle antenna tuned to the required operating frequencies through special apertures in the antenna element. The antenna was developed in cooperation with the Faculty of Electrical Engineering of the Czech Technical University in Prague.

Members of the department succeeded in the competition for funds from the programme FP7 CAPACITY with the project Advanced Communication Systems and Technologies. The department became a member of the partnership for international cooperation project COST IC0803 RF/Microwave Communication Subsystems for Emerging Wireless Technologies (RFCSET).

In cooperation with the company Barco, a special segmental meander antenna for RFID applications was developed. A system of automated measurements of radio FM tuners was developed for Škoda-Auto. In cooperation with Volkswagen, concepts of universal antennas for vehicles were developed. For Omikron – welding machines, the department designed a processor unit for the multifunction welding system. For Omikron – Marine, a control unit and a controller were developed for BLCD engines of small boats. Systems for zoning measurements and magnetic measurements of shielded chambers were innovated for the National Security Office of the Czech Republic.

Two new laboratories were built at the department. A technological laboratory of applied electronics is used by the students and staff of the department for production of printed connections and planar structures by dry and wet techniques and for photographic preparation of patterns. The unreflective shielded EMC chamber can be used for weak electromagnetic fields of electronic devices and components.

Within the framework of the National Research Programme II, the department prepared and organized a series of popularization lectures

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: Jiří Svačina

Electronics and Communication Technology – Adventure and Challenge for Young Generation – NPV II - 2E06007
Investigator: Jiří Svačina

Compression and Wireless Transfer of Video Signals at Low Bit Rates – GA AV ČR KJB208130704
Investigator: Tomáš Frýza

Communication Systems for Experimental Satellites – GAČR 102/06/1672
Investigator: Miroslav Kasal

Methodology of the Design of High Reliability Optical Wireless Links – GAČR 102/06/1358
Investigator: Aleš Prokeš

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: Jiří Svačina

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

Selected Publications

BOBULA, M.; DANĚK, K.; PROKEŠ, A. Implementation of Industrial Narrow Band Communication System into SDR Concept. Radioengineering, 2008, vol. 17, no. 4, pp. 86-92. ISSN: 1210-2512.

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DŘÍNOVSKÝ, J.; SVAČINA, J.; RAIDA, Z. Simple Models of EMI Filters for Low Frequency Range. Radioengineering, 2008, vol. 17, no. 3, pp. 8-14. ISSN: 1210-2512.

GLEISSNER, F.; HANUS, S. Co-channel and Adjacent Channel Interference Measurement of UMTS and GSM/EDGE Systems in 900 MHz Radio Band. Radioengineering, 2008, vol. 17, no. 3, pp. 74-80. ISSN: 1210-2512.

JILKOVÁ, J.; RAIDA, Z. Ultrawideband Coplanar-Fed Monopoles: A Comparative Study. Radioengineering, 2008, vol. 2008, no. 17, pp. 37-42. ISSN: 1210-2512.

KOLKA, Z.; WILFERT, O.; BIOLKOVÁ, V. Reliability of Digital FSO Links in Europe. International Journal of Electronics, Circuits and Systems (IJECS), 2008, vol. 1, no. 4, pp. 236-239. ISSN: 1307-4156.

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KOVÁČ, M. Asynchronous Microcontroller Simulation Model in VHDL. Proceedings of World Academy of Science, Engineering And Technology, 2008, vol. 35, no. 11, pp. 183-186. ISSN: 2070-3740.

KRATOCHVÍL, T.; ŠTUKAVEC, R. DVB-T Digital Terrestrial Television Transmission over Fading Channels. Radioengineering, 2008, vol. 17, no. 4, pp. 96-102. ISSN: 1210-2512.

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MIKULKA, J.; HANUS, S. Bluetooth and IEEE 802.11b/g Coexistence Simulation. Radioengineering, 2008, vol. 17, no. 3, pp. 66-73. ISSN: 1210-2512.

PETRŽELA, J.; SLEZÁK, J. Conservative chaos generators with CCII+ based on mathematical model of nonlinear oscillator. Radioengineering, 2008, vol. 17, no. 3, pp. 19-24. ISSN: 1210-2512.

POKORNÝ, M.; RAIDA, Z. Modeling of Microwave Semiconductor Diodes. Radioengineering, 2008, vol. 17, no. 3, pp. 47-52. ISSN: 1210-2512.

POKORNÝ, M.; RAIDA, Z.; HORÁK, J. Planar Tri-Band Antenna Design. Radioengineering, 2008, vol. 17, no. 1, pp. 28-36. ISSN: 1210-2512.

RUMÁNEK, J.; ŠEBESTA, J.; POVALAČ, A.; VYSKOČIL, P. Automated System For Zoning Measurement. Proceedings of World Academy of Science, Engineering And Technology, 2008, vol. 35, no. 1, pp. 13-15. ISSN: 2070-3740.

ŘÍČNÝ, V.; STANČÍK, P. Contactless Area Measurement (Contactless Planimeter). Radioengineering, 2008, vol. 17, no. 2, pp. 115-118. ISSN: 1210-2512.

SIGMUND, M. Automatic Speaker Recognition by Speech Signal. In Zemliak A., Frontiers in Robotics, Automation and Control. Advanced Robotics Series. Wien: In-Tech Education and Publishing, 2008. pp. 41-54. ISBN: 978-953-7619-17-6.

SIGMUND, M. Gender Distinction Using Short Segments of Speech Signal. International Journal of Computer Science and Network Security, 2008, vol. 8, no. 10, pp. 159-162. ISSN: 1738-7906.

SIGMUND, M.; NOVOTNÝ, P. Transformations between Pictures from 2D to 3D. In Advances in Intelligent Systems: Concepts, Tools and Applications. Application. Berlin: Springer Verlag, 2008. pp. 299-310. ISBN: 978-0-7923-5966-1.

SLANINA, M.; ŘÍČNÝ, V. Estimating PSNR in High Definition H.264/AVC Video Sequences Using Artificial Neural Networks. Radioengineering, 2008, roč. 17, č. 3, s. 103-108. ISSN: 1210-2512.

SUTORÝ, T.; KOLKA, Z. Characterization of Nonlinear Integrated Capacitors. Radioengineering, 2008, vol. 17, no. 4, pp. 9-14. ISSN: 1210-2512.

ŠEBESTA, J. Discrete-time Phase and Delay Locked Loops Analyses in Tracking Mode. International Journal of Electronics, Circuits and Systems (IJECS), 2008, vol. 1, no. 1, pp. 207-210. ISSN: 1307-4156.

URBANEC, T. Novel Approach for Wideband VNA by Sixport Principle. International Journal of Electronics, Circuits and Systems (IJECS), 2008, vol. 1, no. 4, pp. 203-206. ISSN: 1307-4156.

VÁGNER, P.; KASAL, M. A novel microstrip low-pass filter design method using square-shaped defected ground structure. Microwave and Optical Technology Letters, 2008, vol. 50, no. 9, pp. 2458-2462. ISSN: 0895-2477.

VIDAL MAZÓN, B.; RAIDA, Z. Synthesizing Sierpinski antenna by genetic algorithm and swarm optimization. Radioengineering, 2008, vol. 17, no. 4, pp. 74-78. ISSN: 1210-2512.

Bachelor Programme

Analogue Electronic Circuits (Lubomír Brančík)

Audiofrequency Electronics (Tomáš Kratochvíl)

CAD of Communication Systems (Zbyněk Raida)

CAD of Electronic Circuits (Zdeněk Kolka)

Communication Systems (Aleš Prokeš)

Computers and Programming 2 (Zbyněk Raida)

Electrical Filters (Jiří Petržela)

Electromagnetic Compatibility (Jiří Svačina)

Electronic Instruments Feeding (Jiří Šebesta)

Electronic Practice (Marta Krátká)

EM Waves, Antennas and Lines (Zdeněk Nováček)

Fundamentals of TV Technology (Stanislav Hanus)

HF and Microwave Techniques (Tomáš Urbanec)

HF Techniques and Antennas (Miroslav Kasal)

Microprocessor Techniques (Tomáš Frýza)

Optoelectronics (Otakar Wilfert)

Pulse and Digital Techniques (Jaromír Kolouch)

Radio and Mobile Communication (Stanislav Hanus)

Radio Receivers and Transmitters (Aleš Prokeš)

Signals and Systems (Milan Sigmund)

Special Electronic Devices and Their Applications (Jiří Svačina)

Master Programme

Advanced radio communication systems (Zbyněk Raida)

Antennas and Radio Waves Propagation (Zdeněk Nováček)

CAD in HF and Microwave Techniques (Zbyněk Raida)

Computer and Communication Networks (Zdeněk Kolka)

Computer Systems and their Applications (Zdeněk Kolka)

Digital television systems (Tomáš Kratochvíl)

Electronic Circuits Theory (Jiří Petržela)

Electronics in German (Milan Sigmund)

Microcomputers for Instrumental Applications (Zbyněk Fedra)

Microwave Integrated Techniques (Jiří Svačina)

Mobile Communication Systems (Jan Prokopec)

Photonics and Optical Communications (Otakar Wilfert)

Programmable Logic Devices (Jaromír Kolouch)

Quantum and Laser Electronics (Otakar Wilfert)

Radars and Navigation (Jiří Šebesta)

Radio Links Design (Jaroslav Láčík)

Radio Relay and Satellite Communication (Miroslav Kasal)

Radioelectronic Measurements (Jiří Dřínovský)

Speech Signal Analysis and Synthesis (Milan Sigmund)

Videotechnology (Martin Slanina)

Wireless Communication Theory (Roman Maršálek)

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

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

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

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

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

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

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

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

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

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

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

Service Laboratory of Microprocessor Technology (service laboratory for computer technology, Václav Michálek)

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

EMC Shielded Unreflective EMC Chamber (measurement of weak electromagnetic fields of electronic devices and components, Jiří Dřínovský)

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

Research Laboratory of Digital Signal Processing (research of the methods and techniques for digital image processing, processing of speech signals and digital radiotechnology, Roman Maršálek)

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

Research Laboratory of Optical Communications (research and development of laser optical atmospheric links and optical communication systems, Otakar Wilfert)

Research Laboratory of Optical Communications (research and development of laser optical atmospheric links and optical communication systems, Otakar Wilfert)

Research Laboratory of Numerical Methods (research of the methods of analysis, design and optimization of microwave planar structures and antennas, Zbyněk Lukeš)
EMC pre-Compliance Test Laboratory (laboratory for pre-compliance measurement of interference emissions and electromagnetic resistance testing, Jiří Dřínovský)

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Doc. Ing. Miloslav Filka, CSc.
Doc. Ing. Vladimír Kapoun, 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.

Postgraduate Students

Ing. Hicham Atassi, Ing. Miroslav Bernkopf, Ing. Radim Burget, Ing. Vít Daněček, Ing. Jan Hajný, Ing. Pavel Hanák, Ing. Dušan Havelka, Ing. Norbert Herencsár, Ing. Jiří Hošek, Ing. Filip Janovič, Ing. Mojmír Jelínek, Ing. Jan Jeřábek, Ing. Jan Kacálek, Ing. Michal Kohoutek, Ing. Vítězslav Kot, Ing. Jaroslav Koton, Ing. Jiří Kouřil, Ing. Martin Koutný, Ing. Ivan Koula, Ing. Petr Kovář, Ing. Ondřej Krajsa, Ing. Vítězslav Křivánek, Ing. Martin Kyselák, Ing. František Kyselý, Ing. Petra Lambertová, Ing. Tomáš Langer, Ing. Tomáš Lukl, Ing. Jan Malý, Ing. Jaromír Mačák, Ing. Tomáš Mácha, Ing. Zdeněk Martinásek, Ing. Ivan Míča, Ing. Martin Minarčík, Ing. Petr Mlýnek, Ing. Patrik Morávek, Ing. Jakub Müller, Ing. Lukáš Palko, Ing. Tomáš Pelka, Ing. Václav Pfeifer, Ing. Michal Polívka, Ing. Zdeněk Průša, Ing. Jiří Přinosil, Ing. Radim Pust, Ing. Ondřej Rášo, Ing. Pavel Reichert, Ing. Lukáš Růčka, Ing. Anna Shklyaeva, Ing. Michal Skořepa, Ing. Jiří Sobotka, Ing. Peter Stančík, Ing. Vojtěch Stejskal, Ing. Martin Sýkora, Ing. Milan Šimek, Ing. Ondřej Šmirg, Ing. Jan Vlach

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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 multimedia, i.e. digital processing of speech, music or images. The department is successful in obtaining sufficient funding from various research and education projects. The research and development teams in the department were involved in projects relating to basic and applied research in the total amount of nearly 55 million CZK. A research team is engaged in providing up-to-date multimedia services via mobile and wireless networks. Some members of the team are involved in a research and development programme of the Ministry of Industry and Trade. 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 Satturn 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 a new generation communication IP system, universal architecture for DTV multicast for IP networks and other. The department conducted the international project European Tempus – Erasmus Mundus to start the study area Teleinformatics in Syria.

Major Achievements

The main research interests of the department are communication systems focused on media informatics. We have established a new laboratory for research of multimedia technologies and algorithms for processing of audio signals in modern multicast systems. There are loudspeaker systems in configuration 6.1 in accordance to ITU-R BS 775. The acoustics of the laboratory secures short response and frequency balanced characteristics of reception in accordance with the Czech standard ČSN 73 0526. Available in the room is computer and audio technology, software applications for processing of audio signals and measuring microphones, including a system of microphones for ambisonic recording of sound.

Another newly built videoconferencing laboratory is focused on research and optimization of videoconferencing transmission and hypermedia services. The fundamental part of the system is the KIT IVP (Interactive Video Platform) KIT IVP (Interactive Video Platform) for the development and testing of new videoconferencing applications and services. It is based on a linux server and uses MCU and MVP. Another line of research are applications for audio and video data streaming. The laboratory has also been equipped with hardware H.323, end point Polycom HDX7000 for testing outputs with high HD resolution. The laboratory is also equipped with the videoconferencing infrastructure RADVISION. The centre of the infrastructure is the videoconferencing system SCOPIA 400/48 consisting of the MCU (Multipoint Control Unit) and two Media Video Processing units. This videoconferencing system can serve up to 96 standard videoconferencing ports and up to 32 HD ports with high resolution. Part of the videoconferencing infrastructure is the software SCOPIA Desktop Client for complex testing of videoconferencing connection from any terminal in the laboratory of multimedia services, in high resolution, with all supplementary services.

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 of Protected Internet Communication with Remote End Power Devices – GA AV ČR 1ET110530523
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

Novel Approaches to Equalization in Modern Digital Transmission Systems – GAČR 102/06/P160
Investigator: Pavel Šilhavý

Circuits with Universal Current and Voltage Conveyors and Operating Current Amplifiers – GAČR 102/06/1383
Investigator: Kamil Vrba

An Optimization of Algorithms for Digital Processing of Audio Signals – GAČR 102/06/1233
Investigator: Jiří Mišurec

Optimization of Multicast Methods in IP Networks – GA AV ČR 1ET301710508
Investigator: Dan Komosný

Optimal Algorithms for Accurate Calculation of Wavelet Transform of Real-Time Signal – GAČR 02/06/P407
Investigator: Pavel Rajmic

Support through Research Partnerships for Improving Working Conditions in Research by means of Telematic Services – MŠMT 2E08035
Investigator: Miroslav Balík

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

Sophisticated Methods of Support for Services in New Generation Mobile Networks– GAČR 102/06/1569
Investigator: Vít Novotný

Sophisticated Noise and Interference Suppressors in Speech Signal Transmission for New Generation Fixed and Mobile Networks – GA AV ČR 1ET301710509
Investigator: Zdeněk Smékal

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 of New-Generation of Centre-Controlled Infusion Pumps – GA AV ČR 1ET110540521
Investigator: Pavel Šilhavý

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 Architecture for Information and Videoconferencing Systems– MPO FT-TA/081
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 and Development of the Secured Data Communication System GPRS – MPO FT2/073
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

Selected Publications

ATASSI, H.; ESPOSITO, A. A speaker Independent Approach for Emotion Recognition. Tools with artificial inteligence, 2008, vol. 2008, no. 1, pp. 147-151. ISSN: 1082-3409.

BURDA, K. Threat analysis based on the graph of elementary threats. International Journal of Computer Science and Network Security, 2008, vol. 8, no. 12, pp. 66-68. ISSN: 1738-7906.

BURGET, R.; KOMOSNÝ, D.; MÜLLER, J. Best Effort Hierarchical Aggregation Tree for IPTV Signaling. International Journal of Computer Science and Network Security, 2008, vol. 2008, no. 8, p. 1-5. ISSN: 1738-7906.

GESCHEIDTOVÁ, E.; KUBÁSEK, R.; SMÉKAL, Z.; BARTUŠEK, K. Design of pre-emphasis compensation for MR tomograph. International Transaction on Computer Science and Engineering, 2008, vol. 45, no. 1, pp. 161-173. ISSN: 1738-6438.

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

HERENCSÁR, N.; KOTON, J.; VRBA, K.; MIŠUREC, J. A Novel Current-Mode SIMO Type Universal Filter Using CFTAs. Contemporary Engineering Sciences, 2009, vol. 2, no. 2, pp. 59-66. ISSN: 1313-6569.

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JEŘÁBEK, J.; KOTON, J.; VRBA, K. Generalized Design Method of Multifunctional Frequency Filters. International Transaction on Computer Science and Engineering, 2008, vol. 49, no. 1, pp. 85-92. ISSN: 1738-6438.

KOTON, J.; VRBA, K. Designing Pure Current-Mode Frequency Filter Using the MCMI. International Transaction on Computer Science and Engineering, 2008, vol. 49, no. 1, pp. 197-203. ISSN: 1738-6438.

KOUTNÝ, M.; MIŠUREC, J.; MLÝNEK, P. A Secure System for Data Collection in GSM Networks. International Journal of Computer Science and Network Security, 2008, vol. 8, no. 11,pp. 1-5. ISSN: 1738-7906.

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.

KOVÁŘ, P.; NOVOTNÝ, V. New Analytical Model of Distributed Coordination Function. International Journal of Computer Science and Network Security, 2008, vol. 2008, no. 11, pp. 125-129. ISSN: 1738-7906.

KŘIVÁNEK, V. Comparison of the convolutional codes design complexity. International Transaction on Computer Science and Engineering, 2008, vol. 47, no. 1, pp. 43-48. ISSN: 1738-6438.

KŘIVÁNEK, V. Enhancement in the Protection of Transmitted Data. International Journal of Computer Science and Network Security, 2008, vol. 8, no. 7, pp. 95-98. ISSN: 1738-7906.

KUBÁNEK, D.; VRBA, K. State-Variable Higher-Order Filters with Differential Input/Output Current Followers. International Transaction on Computer Science and Engineering, 2008, vol. 49, no. 1, pp. 186-196. ISSN: 1738-6438.

KYSELÁK, M.; DOROCIAK, P.; FILKA, M. The Optical Modulation Format Impact on Polarization Mode Dispersion. International Journal of Computer Science and Network Security, 2008, vol. 2008, no. 5, pp. 27-30. ISSN: 1738-7906.

KYSELÁK, M.; FILKA, M.; KREJČA, L. Simulation of pulse propagation in WDM systems. International Transaction on Computer Science and Engineering, 2008, vol. 46, no. 5, pp. 150-155. ISSN: 1738-6438.

MÁCHA, T.; STANČÍK, P.; NOVOTNÝ, V. Connectivity in a wireless sensor network. International Journal of Computer Science and Network Security, 2008, vol. 2008, no. 12, pp. 1-10. ISSN: 1738-7906.

MINARČÍK, M.; VRBA, K. Single-Input Six-Output Voltage-Mode Filter Using Universal Voltage Conveyors - IF 0,287. IEICE Transactions on Fundamentals of Electronics Communications And Computer Sciences, 2008, vol. E91-A, no. 8, pp. 2035-2037. ISSN: 0916-8508.

GESCHEIDTOVÁ, E.; KUBÁSEK, R.; SMÉKAL, Z.; BARTUŠEK, K. Digital Filter Banks in MR Measurement of Gradient Magnetic Fields. Applied Magnetic Resonance, 2008, vol. 33, no. 4, pp. 399-417. ISSN: 0937-9347.

MINARČÍK, M.; VRBA, K. Voltage Conveyors and Its Applications. International Transactions on Communication and Signal Processing, 2008, vol. 19, no. 10, pp. 1-9. ISSN: 1738-9682.

MIŠUREC, J. Interference in data communication over narrow-band PLC. International Journal of Computer Science and Network Security, 2008, vol. 2008, no. 11, pp. 281-285. ISSN: 1738-7906.

MIŠUREC, J.; ZEMAN, V. Concurrent Data Communication of DS2 and Home Plug PLC Systems. International Transaction on Computer Science and Engineering, 2008, vol. 49, no. 1, pp. 204-212. ISSN: 1738-6438.

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.

MLÝNEK, P.; MIŠUREC, J. System for testing the robustness of the LAN communication unit of remote data acquisition. International Transaction on Computer Science and Engineering, 2008, vol. 49, no. 1, pp. 147-156. ISSN: 1738-6438.

MOLNÁR, K. Implementation of a TCP-based process model in OPNET Modeler. Electronics, 2008, vol. 17, no. 3, pp. 145-150. ISSN: 1313-1842.

MORÁVEK, P.; KOMOSNÝ, D.; JELÍNEK, M.; ŠIMEK, M. Visualization of a Hierarchical Aggregation in the IPTV Network Environment. International Journal of Computer Science and Network Security, 2008, vol. 8, no. 11, pp. 210-216. ISSN: 1738-7906.

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NOVOTNÝ, V.; KOMOSNÝ, D. Large-Scale RTCP Feedback Optimization. Journal of Networks, 2008, vol. 2008, no. 3,pp. 1-10. ISSN: 1796-2056.

PELKA, T.; POLÍVKA, M. Comparison of Python virtual machines. Linux+, 2008, vol. 2008, no. 11, pp. 1-8. ISSN: 1733-4209.

PŘINOSIL, J.; MÍČA, I.; KROLIKOWSKI, M. Face and Eyes Localization in Color Images Using the Viola-Jones Detector. International Transaction on Computer Science and Engineering, 2008, vol. 49, no. 1, pp. 169-176. ISSN: 1738-6438.

PŘINOSIL, J.; SMÉKAL, Z.; ESPOSITO, A. Combining Features for Recognizing Emotional Facial Expressions in Static Images. Lecture Notes in Computer Science, 2008, no. 5042, pp. 59-71. ISSN: 0302-9743.

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SMÉKAL, Z., BARTUŠEK, K., MACHÁLKA, M., LIBERDA, O., ŠPRLÁKOVÁ, A. Post-processing of TMJ MR images. Journal of Cranio-Maxillofacial Surgery, 2008, vol. 36, no. 9, p. 276 (1 p.). ISSN: 1010-5182.

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ŠMIRG, O.; MÍČA, I. Moving Object Detection in Video Sequences using Modified Mixture of Gaussians. International Transaction on Computer Science and Engineering, 2008, vol. 2008, no. 1, pp. 117-125. ISSN: 1738-6438.

Bachelor Programme

Accesses and Transports Networks (Vladislav Škorpil)

Analog Technology (Kamil Vrba)

CISCO Academy I,II (Dan Komosný)

Communication Technology (Ivo Herman)

Data Communication (Karel Němec)

Design of Electronic Devices (Kamil Vrba)

Digital Filters (Petr Sysel)

Digital Signal Processing (Jiří Mišurec)

Electroacoustics (Jiří Schimmel)

Hardware of Computer Networks (Karol Molnár)

High-speed Communications Systems (Vladislav Škorpil)

Introduction to Computer Typography and Graphics (Pavel Rajmic)

Multimedia Services (Otto Dostál)

Network Architecture (Vít Novotný)

Network Operating systems (Dan Komosný)

Practical Exercises in Information Networks (Karol Molnár)

Signals and Systems Analysis (Zdeněk Smékal)

Studioengineering (Ladislav Káňa)

Terminal Equipment (Vít Novotný)

Transmission Media (Miloslav Filka)

Master Programme

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

Advanced Communication Techniques (Jan Jeřábek)

Advanced Data Transmission Technology (Václav Zeman)

Advanced Techniques of Image Processing (Kamil Říha)

CISCO Academy I,II (Dan Komosný)

Computers and Peripheral Devices (Miroslav Balík)

Computer-Supported Solution of Engineering Problems (Jiří Mišurec)

Cryptography (Václav Zeman)

Digital Audio Signal Processing (Miroslav Balík)

Digital Signal Processing (Zdeněk Smékal)

Digital Signal Processors (Petr Sysel)

Graphic and Multimedia Processors (Zdeněk Smékal)

Information System Security (Karel Burda)

Mobile Network Communication Systems (Vít Novotný)

Modern Network Technologies (Karol Molnár)

Multimedia (Otto Dostál)

Optical Networks (Miloslav Filka)

Parallel Computing Under Operating Systems. (Ivo Herman)

Projecting, Administration and Security (Karel Burda)

Security Systems (Karel Burda)

Sensor Systems (Ivan Rampl)

Services of Telecommunication Networks (Vladislav Škorpil)

Speech Processing (Zdeněk Smékal)

Theoretical Informatics (Radim Burget)

Theory of Communication (Karel Burda, Milan Berka)

Doctoral Programme

Applied Cryptography (Karel Burda)

Modern Network Technology (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 CISCO Academy (instruction in CISCO Academy courses for all study areas at FEEC BUT)

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 (research into design and multimedia communication services including digital processing of multimedia data, Ing. 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, Vladimír Kapoun)

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 Rampl)

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

Laboratory of High-Rate Communication Systems (research and instruction in high-rate data transmission up to a mimimal 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 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 information of citizens, Karel Burda)

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

Department of Theoretical and Experimental Electrical Engineering

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Associate Professors

Doc. Ing. Pavel Fiala, Ph.D.
Doc. Ing. Eva Gescheidtová, CSc.
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.

Postgraduate Students

Ing. Marin Friedl, Ing. Radim Kadlec, Ing. Vratislav Michal, Ing. Jan Mikulka, Ing. Zeněk Roubal, Ing, Michal Zycháček

Administrative and Technical Staff

Ing. Tibor Bachorec, Ph.D., Eva Cupáková, Ing. Michal Hadinec, Ing. Tomáš Jirků, Ing. Petr Koňas, Ph.D., Ing. Taťána Krajčírovičová, Ing. Tomáš Kříž, Veronika Raabová, Ing. Jan Rychnovský, Ing. Zoltán Szabó, Ing. Alice Špérová

Main Interests

Research is focused on impedance tomography methods in numerical modelling. In cooperation with the Institute of Instrument Technology, Academy of Sciences Brno, the evaluation of MR images with the aid of numerical modelling is investigated as well as the evaluation of NMR images in strongly disturbed or distorted NMR signals. The two-processor stations ALTIX and the 16-processor station WOOD are used for extensive tasks. Within the framework of projects of the Ministry of Industry and Trade, research of microwave sources up to 250 MW has been conducted. Cooperation with VOP 026 Štenberk, VTUPV research on a microwave source – vircator in TESLA Hloubětín continues.

Within the framework of filter research, student placements are in progress. In 2008 one student working on his diploma thesis was granted a placement at I.S.E.P. and six students from ISEP Paris were in placements at UTEE. Cooperation has been carried out with the company Optaglio and with the Institute of Instrument Technology of Academy of Sciences Brno in research of nanomaterials. Basic research of numerical models of elementary mass particles was commenced in cooperation with the Institute of Instrument Technology. The department is also involved in research on measurement methods for the concentration of air ions and in basic and applied research on the measurement of single electromagnetic pulses.

As a part of the department, the Institute of experimental technologies focused on human resources started work.

Major Achievements

The results of an experimental research of MR technology for measurement of gradient magnetic fields as well as the results of the research of 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. A sensor for scanning the pulse voltage with the pulse length under 100 ns - VOP026 VTUPV, project GENVLN MO – was implemented and introduced. A sensor for measurement of free air ions was tested and calibrated. Prototypes of different concepts of the vibration mini- and microgenerators were implemented, also in cooperation with the partnership of the 6th framework programme EADS. The patent application for a vibration generator was accepted. In cooperation with the Institute of Instrument Technology the prototype of an unreflective chamber for filter diagnostics was developed, modules for construction of the unreflective chamber from 500MHz to 10GHz were implemented. Also implemented was the prototype of a special light source for the basic research at Masaryk University, research of arctic flora. Prototypes of sensors for scanning a single process on the induction principle were implemented and tested. A number of numerical analyses were carried out for ABB s.r.o. with an international opposition procedure for sensors in the 16-processor grid station WOOD. A unique numerical analysis was conducted of noise effects in the measuring current transformer TJP5, TPU5 and on the measuring current transformer from ABB s.r.o. New equipment was acquired for research laboratories of dynamic laser interferometry. Cooperation has continued with Prof. Hiroshi Kikuchi, Tokyo University, basic research of microscopic electrohydrodynamic models, with focus on biomedical applications.

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

Selected Publications

BARTUŠEK, K.; DOKOUPIL, Z.; GESCHEIDTOVÁ, E. DSP Based Temperature Controller in Gradient System for MR Tomography. International Transaction on Computer Science and Engineering, 2008, vol. 47, no. 1, pp. 1-8. ISSN: 1738-6438.

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Bachelor Programme

Electrical Engineering 1 (Jiří Sedláček)

Electrical Engineering 2 (Jiří Sedláček)

Measurement in Electroengineering (Karel Bartušek)

Safe Electrical Engineering (Pavel Kaláb)

Seminar of Electrical Engineering (Miloslav Steinbauer)

The C++ Programming Language (Pavel Fiala)

Master Programme

Electrical Installations (Pavel Kaláb)

Electromagnetic Field Modeling (Jarmila Dědková)

Safe Electrical Engineering (Pavel Kaláb)

Doctoral Programme

Numerical Computations with Partial Differential Equations (Libor Dědek)

Special Measuring Methods (Karel Bartušek)

Laboratories

Laboratory of Electrical Measurements (instruction in Measurement in Electrical Engineering, Eva Gescheidtová)

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

Computer Laboratory (26 computers, Miloslav Steinbauer)

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

Research Laboratory of Electrical Circuits (research laboratory of electrical engineering, development of prototypes, construction and measurement workplace, Jiří Sedláček)

Research Laboratory of Electro-Optics (laboratory of laser technology and optoelectronics, Eva Kroutilová)

Research Laboratory of Magnetic Measurement (research laboratory with special measuring devices for magnetic measurement, Jiří Rez)

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

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

Research Laboratory of Pulse Sources and Microwave Devices (laboratory for research of high-frequency technology, electromagnetic shielded chamber (EMSK), air-conditing, high-frequency measuring device, Pavel Fiala)

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

Department of Power Electrical and Electronic Engineering

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Professors

Prof. RNDr. Vladimír Aubrecht, CSc.
Prof. Ing. Vítězslav Hájek, CSc.
Prof. Ing. Karel Hruška, DrSc.
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., Ing. Dalibor Červinka, Ph.D.

Postgraduate Students

Ing. Mustafa Osman Elrayah Aboelh, Ing. Josef Běloušek, Ing. Jan Hejkrlík, Ing. Rostislav Huzlík, Ing. Marcel Janda, Ing. Petr Mazur, Ing. Aleš Mikulčík, Ing. Vladimír Minárik, Ing. Jan Němec, Ing. Jan Ondrák, Ing. Ivo Pazdera, Ing. Petr Procházka, Mohamed Abdusalalam Shaban, Ing. Miroslav Skalka, Ing. Jakub Žajdlík, Ing. Alice Špérová, Ing. Tomáš Cibulka

Administrative and Technical Staff

Josef Daněk, Ing. Jiří Duroň, Ph.D., Ing. Zdeněk Feiler, Ph.D., Ing. Marcel Janda, Zdeněk Koráb, Zdeněk Liška, Ing. Petr Melichar, Ph.D., Alena Šmídková

Main Interests

The department provides instruction in the study area Power Electrical and Electronic Engineering in all degree programmes. Besides theoretical subjects, instruction is provided in basic disciplines such as theory and construction of electrical machines and devices, recently 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 and its applications in electric drives and supply systems, management control theory and its application in the design of complicated dynamic systems and technological processes, automotive technology and electronics.

Research and development are centred on basic research on theoretical modelling of radiation energy transport in thermal plasma. Applied research and development are focused on low-voltage electric machines for automotive industry, optimization and identification of parameters of electric machines using artificial intelligence, development of special machines such as startergenerators, controlled magnetic bearings, levitation systems, etc. Work continued on exploitation of the circuit energy to create conditions for electric arc blowout in low and high-voltage devices. The department is also engaged in research of electric energy converters of extreme parameters, utilization of ultracapacitors in cooperation of electronic converters, batteries and electrical machines especially in electric traction. Long-term research and innovation of sliding contacts, targeted at an improvement of operating characteristics of electrical machines, has been conducted. The department cooperates with a number of technical universities, e.g. TU Gliwice, TU Delft, TU Košice, TU Žilina, MU Brno, TU Pskov, TU Omsk, Polytechnical University Saint-Petersburg and industrial companies and institutions, e.g. Siemens AG - Corporate Technology, JSC Electrocontact (Kineshma-RF), Siemens Elektromotory Drásov, Magneton Kroměříž, OEZ Letohrad, APS Světlá nad Sázavou, ATAS Náchod, EMP Slavkov u Brna, JULI Motorenwerk Moravany u Brna, VUES Brno a.s., IVEP Brno a.s. and other.

Major Achievements

In 2008, work on the EU Leonardo da Vinci project EDIPE was accomplished. The results were published also in the Parliament Magazíne – a special edition on the occasion of the Czech EU Presidency of 15 December 2008, European Universities Shared Laboratories.

In the frame of the project Impuls "An axial trigger with 2kW gear", prototypes have been made and production is being prepared. In the frame of the project Impuls design methodology for the stacking transformer for current protector and an operating sample of the stacking transformer for current protector 250 and 630A, nominal current 16-250A (16-630 A), nominal voltage 230/400V have been made, protector type A in connection with trip relay. In the frame of the project Impuls of the Ministry of Industry and Trade "Research and Development of Generators with Axial Heights over 800mm" for the company Siemens Elektromotory Drásov a prototype of the machine with an output of 5MW was produced.

In cooperation with the Faculty of Mechanical Engineering the department developed and implemented a hydraulic spinning turbine. It was granted the Utility Model Registration Certificate.

The department developed the following facilities: a 50V/1000A dc source for supply of the feeding exciting winding for the dc traction engine for electric locomotives, a digital control system for 1MW dc traction drive for electric locomotives, 100kW three-phase converter for feeding ventillators. A 100kW three-phase sinusoidal LC-filter. Experiments for the theoretical and practical study of an innovated sliding contact were prepared in the laboratories of TU Omsk and the power station TEC-5 in Omsk. The achieved average reduction in brush wearout by 84% is an excellent result on the global scale. In cooperation with DPMB Brno, we tested a trolley of original construction on the trolleybus ŠKODA 14TR, car 3257. The results were utilized for a further improvement of the relay.

The development of an electromobile supplied from a hydrogen fuel cell continued within the framework of a GAČR project.

Major Research Projects

Axial Starter with 2 kW Epicyclic Gear – MPO FI-IM3/202
Investigator: Vítězslav Hájek

Wireless Sensing – 6th FP EU WISE (Wireless Sensing) AST-CT-2004-516470-WISE
Investigator: Čestmír Ondrůšek

Electric Engines with Electronic Control – MPO FI-IM3/023
Investigator: Vítězslav Hájek

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

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

Optimization of Small Electrical Machines– GAČR GA102/06/1320
Investigator: Vítězslav Hájek

Application of the Methodology TRIZ in Support of Industry Competitiveness– MŠMT 1P05ME760
Investigator: Bohuslav Bušov

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

Synchronous Drives of Wiper Mechanisms – MPO FI-IM3/035
Investigator: Vítězslav Hájek

Exploitation of Fuel Cells in Ecological Sources of Electrical Power and in Traction Drives – GAČR 102/06/1036
Investigator: Miroslav Patočka

Development of Protector Relays - "Hermés" – MPO FI-IM4/161
Investigator: Zdeněk Vávra

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

Selected Publications

BARTLOVÁ, M.; AUBRECHT, V. Approximate Calculations of Continuous Spectra of Diatomic Molecules. Chemické listy, 2008, vol. 102, no. 16, p1341 (6 pp.)ISSN: 0009-2770.

BAUER, P.; FEDÁK, V.; HÁJEK, V. Practical Application of E-learning in Electrical Engineering. In INNOVATIONS 2007. Innovations. USA: iNEER, 2008. pp. 311-319. ISBN: 978-0-9741252-6-8.

HADAŠ, Z.; SINGULE, V.; ONDRŮŠEK, Č. Optimal Design of Vibration Power Generator for Low Frequency. Solid State Phenomena, 2009, vol. 2009, no. 147-149, pp. 426-431. ISSN: 1012-0394.

LAPČÍK, J.; HUZLÍK, R. Sealless Industrial Pump With Permanent Magnet Slotless Disc Motor And Magnetic Bearings. Prace Naukowe Instytutu Maszin, Napedów i Pomiarów Elektrycznych Politechniki Wroclawskiej, 2008, vol. 1, no. 62, pp. 209-860. ISSN: 1733-0718.

SKALKA, M.; ONDRŮŠEK, Č. Analysis of Short-Circuit Current Effect to Magnetic Field Distribution of Synchronnous Machine. Prace Naukowe Instytutu Maszin, Napedów i Pomiarów Elektrycznych Politechniki Wroclawskiej, 2008, vol. 1, no. 62, pp. 337-342. ISSN: 1733-0718.

SLAVÍČEK, P.; KLÍMA, M.; BRABLEC, A.; AUBRECHT, V. RF Discharge at Atmospheric Pressure - Diagnostics and Applications. Chemické listy, 2008, vol. 102, no. 16, p1338 (3 pp.)ISSN: 0009-2770.

VÍTEK, O.; HÁJEK, V. Design and analysis of an automotive alternator. Prace Naukowe Instytutu Maszin, Napedów i Pomiarów Elektrycznych Politechniki Wroclawskiej, 2008, vol. 1, no. 62, pp. 222-226. ISSN: 1733-0718.

VÍTEK, O.; HÁJEK, V.; MELICHAR, P.; DUROŇ, J. Design and measurement of the low voltage EC-motor. Prace Naukowe Instytutu Maszin, Napedów i Pomiarów Elektrycznych Politechniki Wroclawskiej, 2008, vol. 1, no. 62, pp. 216-221. ISSN: 1733-0718.

Bachelor Programme

Automobile Electric and Electronic Systems (Vítězslav Hájek)

Computer Aided Design (Hana Kuchyňková)

Computer Methods in High Power Engineering (Radek Vlach)

Computer Science in High Power Engineering (Vladimír Aubrecht)

Computer Visualization and Animation (Hana Kuchyňková)

Control Electronics (Miroslav Patočka)

Control Theory (Jiří Skalický)

Design of Electrical Drives (Jiří Skalický)

Electrical Drives (Josef Koláčný)

Electrical Machines (Čestmír Ondrůšek)

Electrotechnical Inspection and Supervision (František Veselka)

Microprocessor Techniques for Drives (Miroslav Patočka)

Power Electronics (Jaromír Vrba)

Master Programme

AC Drives (Jiří Skalický)

Adaptive and Optimal Control of Drives (Jiří Skalický)

Computer Modelling in Power Electrical Engineering (Hana Kuchyňková)

Connection and Protection of Indoor Installations (Jaromír Vaněk)

Control Elements in Electrical Drives (Pavel Vorel)

Control Elements of Electrical Drives in Heavy Current Engineering (Zdeněk Feiler)

Control of Dynamic Systems (Petr Huták)

Design of Electrical Drives (Jiří Skalický)

Electric Equipments for Motor Vehicles (Vítězslav Hájek)

Electric Machines and Apparatus Design (Zdeněk Vávra)

Electrical Controlled Drives (Jiří Skalický)

Electrical Microdrives (Josef Koláčný)

Electromechanical System Dynamics (Čestmír Ondrůšek)

Electromechanical Systems (Čestmír Ondrůšek)

Electrotechnical Inspection and Supervision (František Veselka)

Industrial Electronics (Pavel Vorel)

International Cooperation of Quality Assurance (Karel Hruška)

Laboratory of Electric Drives (Josef Koláčný)

Laboratory of Electrical Machines and Apparatuses (František Veselka)

Microcomputer Control of Electrical Drives (Jiří Skalický)

Micromachines (Vítězslav Hájek)

Nondestructive Testing and Monitoring (Karel Hruška)

Plasma Physics and Diagnostics (Vladimír Aubrecht)

Power Converter Design (Miroslav Patočka)

Power Converter Technique (Miroslav Patočka)

Principles of Power Electronics (Miroslav Patočka)

Project Management of Innovation (Bohuslav Bušov)

Quality Assurance and Metrology (Karel Hruška)

Special Technology (František Veselka)

Technical Requirements on Production Evaluation (Karel Hruška)

TIPS-Theory of Inventive Problem Solving (Bohuslav Bušov)

Doctoral Programme

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

Topical Issues of Electrical Machines and Apparatus (Čestmír Ondrůšek)

Laboratories

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

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

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

Laboratory of Electrical Apparatus (research of switching device, Jaromír Vaněk)

Laboratory of Electrical Drives (research of non-linear dynamic systems with changed parameters, Josef Koláčný)

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

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

Laboratory of Mechatronics (Čestmír Ondrůšek)

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

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

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

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

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

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