ANNUAL REPORT 2006

FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

BRNO UNIVERSITY OF TECHNOLOGY

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Introduction

History

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

Electrotechnical disciplines were first taught at the university in 1905. Since 1959 when an independent 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 seven then existing 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 foundation of a new 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 foundation 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.

The Faculty in 2000

Professor Karel Rais was appointed to the Rectorship and took up office on 1 February 2006. One of the leading personalities of the Faculty of Electrical Engineering and Communication Professor Pavel Jura, head of the Department of Control, Measurement and Instrumentation became Vice-Rector for Information and Communication Technologies.

In 2006, the Dean Professor Vrba served his second term in office, together with four vice-deans and the faculty bursar: Jarmila Dědková (Vice-Dean for Bachelor Degree Programme, Acting Dean), Stanislav Hanus (Vice-Dean for Master Degree Programme), Ivo Provazník (Vice-Dean for External Relations and International Affairs, Vladimír Aubrecht, Vice-Dean for Research and Postgraduate Study), Miloslav Morda (Faculty Bursar).

At the end of 2006, there were 188 teachers and 4,151 students in all forms of state-supported programmes. Moreover, education was provided to 298 students of the Faculty of Information Technology and 24 students of the Faculty of Mechanical Engineering and 206 students of the Faculty of Management. On the other hand, the Faculty purchased tuition for 13 students from the

Faculty of Business and Management, for three students from the Faculty of Information Technology, and for 18 students from the Centre of Consultancy and Education. As a result, the total number of students taught at the faculty is 4,455. Education was provided in the ending study programmes Electrical Engineering and Computer Science (EI) on one hand, and in Electrical Engineering, Electronics, Communication and Control Technology (EECR) accredited in 2001 in accordance with the Bologna Declaration. 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 2006 were 579 students who completed their studies in the Bachelor degree programme, 422 Master degree graduates and 44 postgraduates completed their doctoral studies. There were 1,355 students coming to the Faculty, 555 students entered the first year of the follow-up Master study programme, and 85 graduates entered the doctoral degree programme. Tuition in English was provided to 34 international students paying their fees. Five academics were habilitated and appointed associate professors with the title Docent. There were three appointments to professorship.

Events and Activities

- meeting of former deans of FEEC and Rector of Brno University of Technology on the occasion of the 101th birthday of Professor Jiří Brauner, one of the first deans of the Faculty of Electrical Engineering. Professor Brauner appeared in the television documentary “I attended Lenin´s funeral” broadcast on 26 March 2006 on CT 2.
- opening of the first year of the Master degree programme EECR in academic year 2006/07
- application for extended accreditation of the part-time follow-up Master degree programme EECR-M to the Ministry of Education
- preparation and submission of documentation for accreditation of a new Bachelor study programme BTBIO-A Biomedical Technology and Bioinformatics
- development of part-time and distance formats of study in a new structured form of study supported by Development Projects of Ministry of Education
- creation of 72 titles of electronic texts of the total extent of 6,328 pages, and of electronic texts in English as a support of tuition in English in the Bachelor study programme (1,551 pages for 16 subjects)
- activities resulting in expansion and increased quality of study in the new EECR Bachelor degree programme
- preparatory courses for secondary-school students interested in study at FEEC organized to help them prepare for entrance examinations in mathematics (135 enrolled) organized by the Departments of Mathematics and Physics
- Open Door Days (January and November 2006), visits by students and teachers to secondary schools
- participation in GAUDEAMUS 2006, 31 October – 3 November 2006, and presentation of new study programmes offered at the faculty to promote FEEC and arise interest of secondary school students in study at FEEC
- participation in Days of Science 2006 at the Institute of Instrument Technology, Brno, 9-10 November 2006
- participation in the Trade Fair of Mechanical Engineering, 18-22 September 2006, presentation of the Faculty, (mainly mobile robots)
- meeting of the leaderships of the Czech and Slovak faculties of electrical engineering and associated faculties in Trojanovice, May 24-26
- publication of the faculty yearbook 2005/2006, in cooperation with club ELEKTRON

- activities focused on lifelong education, particularly procedures leading to granting the title of docent or professor
- STUDENT EEICT 2006 Conference and Competition organized in cooperation with the Faculty of Information Technology and sponsored by the companies TYCO, HONEYWELL, and other, with 66 Bachelor papers, 85 participants in the Master section, and 80 participants in the Doctoral section
- Activities focused on participation in the ERASMUS-SOCRATES programme and other European programmes
- development of the faculty information system and faculty websites, preparation for transfer to IS Apollo
- activities focused on construction of new premises Pod Palackého vrchem -Technická 10 and Technická 12 to be completed in academic year 2007/08, and including these plans in the Long-Term Plan of Brno University of Technology from 2006
- 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
- acquisition of another research plan to be commenced on 1 January 2007, investigator Prof. Pavel Jura
- activities of the Chairman of Academic Senate Vlasta Krupková in her capacity as a member of the Higher Education Council
- activities of members of Academic Senate and mainly its chairman Vlasta Krupková 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 39th faculty ball at the International hotel

Achievements

In 2006, 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 Trade and Industry, European Commission (FP5 and FP6) 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 three 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

Doc. Ing. Jarmila Dědková, CSc.
Acting Dean, Vice-Dean for Bachelor Degree Programme

Doc. 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.

Faculty Secretary

Ing. Miloslav Morda

Student Advisor to the Dean
Jiří Piškula

Advisor for Equal Opportunities
RNDr. Naděžda Uhdeová, Ph.D.

Trade Unions Representative
Prof. Ing. Vítězslav Hájek, CSc.

Departments

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Department of Power Electrical and Electronic Engineering

Scientific Board

Internal Members

Prof. RNDr. Vladimír Aubrecht, CSc.
Doc. Ing. Jarmila Dědková, CSc.
Doc. Ing. Eva Gescheidtová, CSc.
Doc. Ing. Luboš Grmela, CSc.
Doc. 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, PhD.
Doc. Dr. Ing. Miroslav Patočka
Prof. Ing. Ivo Provazník, Ph.D.
Prof. Dr. Ing. Zbyněk Raida
Prof. Ing. Zdeněk Smékal, CSc.
Prof. Ing. Jiří Svačina, CSc.
Doc. Ing. Petr Toman, Ph.D.
Prof. Ing. Radimír Vrba, CSc.

External Members

Ing. Jiří Potěšil
Ing. Ivan Skalka
Ing. Ladislav Škapa, CSc.
Ing. Rostislav Vinkler
Ing. Jiří Winkler, CSc.
RNDr. Luděk Frank, DrSc.
Ing. Robert Vích, DrSc.
Prof. Ing. Miroslav Husák, CSc.
Doc. Ing. Jiří Masopust, CSc.
Prof. Ing. Aleš Richter, 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
- Microelectronics and Technology
- Power Electrical and Electronic Engineering
- Teleinformatics

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

- Biomedical and Ecological Engineering
- Electronics and Wireless Communication
- Power Electrical Engineering
- Electrotechnical Manufacturing and Management
- Cybernetics, Control and Measurement
- Microelectronics
- Power Electrical and Electronic Engineering
- Communications and Informatics

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

- Cybernetics, Control and Measurement
- Biomedical Electronics and Biocybernetics
- Electronics and Communications
- Microelectronics and Technology
- Power Electrical and Electronic Engineering
- Teleinformatics
- Theoretical Electrical Engineering

Accredited Areas for Habilitation Procedures and Procedures for Appointment to Professorship

- Electronics and Communications
- Electrical and Electronic Technology
- Power Electrical and Electronic Engineering
- Technical Cybernetics
- Theoretical Electrical Engineering

Study Programmes

Bachelor Degree Programme Electrical, Electronic, Communication and Control Technology

The Faculty has been providing education in the Bachelor degree programme Electrical, Electronic, Communication and Control Technology (EECR) since academic year 2002/2003 in full-time format of study, and since 2004/2005 in part-time format study. In 2006, 2,507 students enrolled in the full-time Bachelor study programme EECR-B. A full-time study programme was successfully completed by 565 students, 104 of them in Automation and Measurement (B-AMT), 138 in Electronics and Communications (B-EST), 64 in Microelectronics and Technology (B-MET), 69 in Power Electrical and Electronic Engineering (B-SEE) and 190 in Teleinformatics (B-TLI). Another 175 students applied for extension of the nominal length of study.

In the part-time Bachelor degree programme EECR-BK there were 334 students in 2006 - 170 in the first year, 81 in the second year and 83 in the third year. There were 50 second- and third-year students in the study area Automation and Measurement (BK-AMT), 39 in the study area Electronics and Communications (BK-EST), 7 in Microelectronics and Technology (BK-MET), 26 in Power Electrical and Electronic Engineering (BK-SEE) and 42 in Teleinformatics (BK-TLI).

Admission procedure is a priority of the Faculty. It took place on 6 June 2006. Applications for both full-time and part-time formats of study were accepted. As in the previous year, applicants were required to do tests in an optional combination of mathematics and physics or mathematics and fundamentals of informatics. Exempt from entrance examination were applicants who had passed the school-leaving examination in physics or mathematics with grade 1 or 2, and achieved an average grade less than 2.0 or 2.0. Also exempt from entrance examination were applicants who had attended the preparatory courses in physics and mathematics and completed them with grade 1 or 2 and at the same time achieved a school-leaving average less than 2.0 or 2.0. The maximum possible number of points to be attained in each subject was 50. All those who had attained at least 12 points in each subject and those who were exempt from entrance examination were admitted. A place at FEEC was also offered to applicants for study at FIT who had not been admitted for capacity reasons and attained at least 420 points out of the required 1000 points.

In 2006, there were 1,806 applicants for study at FEEC, 1,541 for full-time study, 1, 177 were admitted in full-time study and 177 in part-time study. Finally, 959 students enrolled in full-time study and 142 students in part-time study. These numbers confirm the high interest in part-time study format.

Admission statistics have been done for many years.

Graph 1 shows numbers of applicants, admitted and enrolled students since 2002. The decreasing numbers of applicants are due to the considerably lower demographic figures. Interest of applicants in study areas was recorded at the end of the first semester after presentations of study areas. Statistics from academic years 2002/03 to 2006/07 are in Table 1.

The quality of incoming students has been monitored for several years. A long-term factor is the percentage of applicants who have taken the school-leaving examination in mathematics or physics, see Graph 2. Contrary to previous years, the number of applicants who had taken the school-leaving examination in mathematics has substantially decreased. This decrease is probably due to the increasing number of incoming students from integrated schools and technical training centres.

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), see Graph 3.

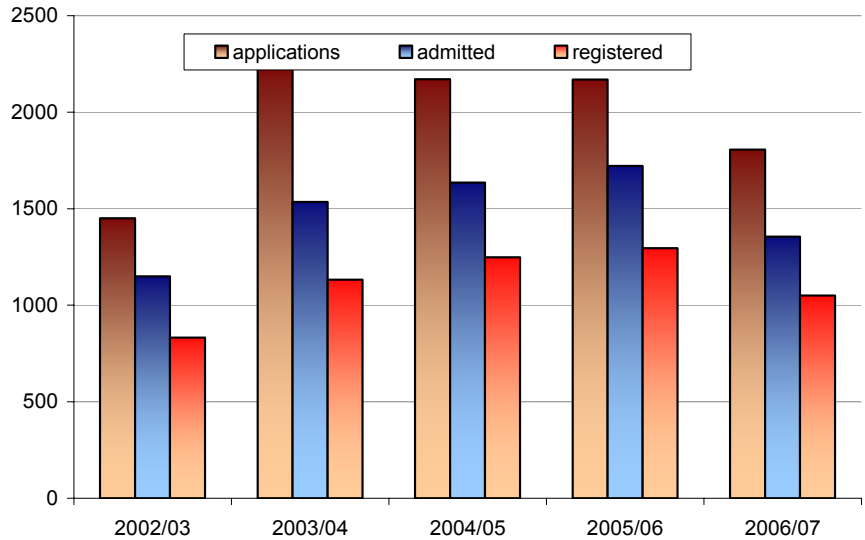
It is obvious that the numbers of applicants coming from gymnasium-type schools and secondary technical schools have increased last year.

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. The course in mathematics was attended by 130 students. The course in physics was cancelled for lack of interest.

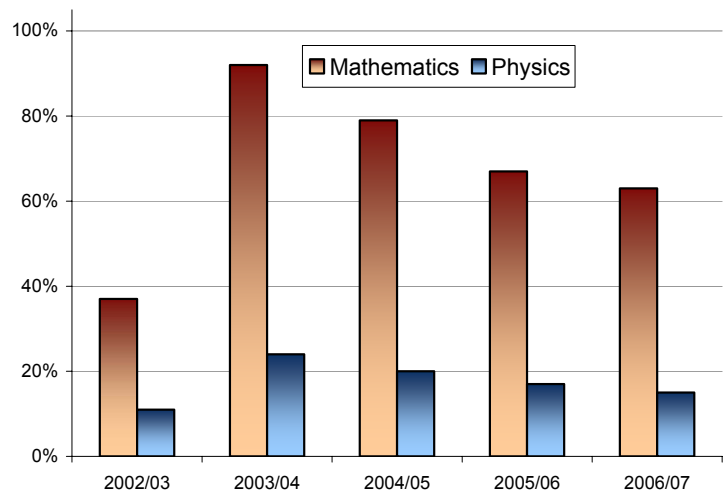
All formats of study and qualifications such as Certificate of Electrotechnical Qualification, Certificate of Pedagogical Practice, Microsoft Certificate, Cisco Certificate are presented in the media. Other activities were focused on promoting the study programmes offered at FEEC and on increasing the number of secondary-school students interested in them. Open Door Days were organized, students and teachers visited secondary schools, and FEEC participated in the 13th 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)

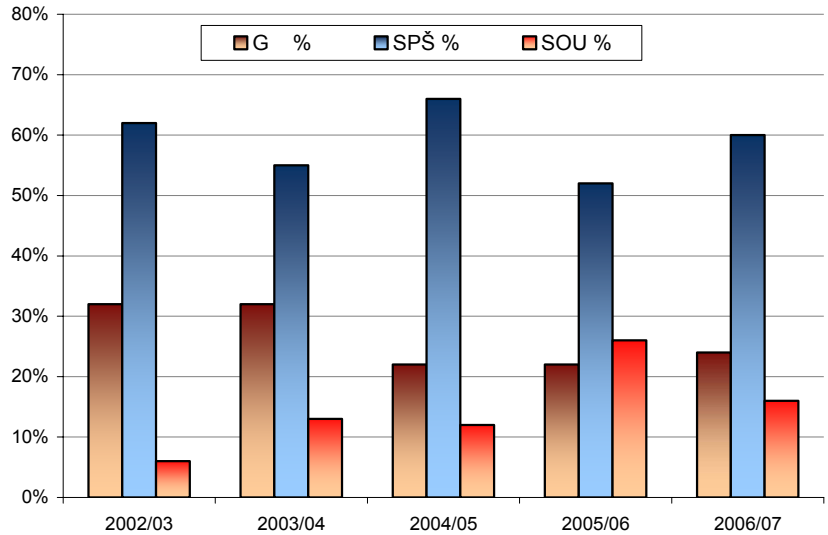
Acad. year		***B-AMT***	***B-EST***	***B-MET***	***B-SEE***	***B-TLI***	***not given***	***total***
2002/03	number	76	250	38	51	295	76	786
	%	10.7	35.2	5.4	7.2	41.5		
2003/04	number	120	248	73	77	329	130	977
	%	14.2	29.3	8.6	9.1	38.8		
2004/05	number	155	243	77	96	362	119	1052
	%	16.6	26.0	8.3	10.3	38.8		
2005/06	number	153	241	74	120	331	119	1052
	%	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		



Graph 1: Applicants, admitted and enrolled in full-time and part-time study, 2002/03 – 2006/07



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 degree programme Electrical, Electronic, Communication and Control Technology in full-time format of study. In 2006, there were 908 students in the programme, 559 in the first year of study and 349 in the 2nd year.

The required documentation for accreditation of the part-time Master study programme EEKR-ML was prepared in 2006 and submitted to the Accreditation Board of the Ministry of Education, which will decide on granting accreditation at the end of February 2007. If accreditation is granted, tuition in the programme will start in academic year 2007-2008. Students who have obtained the Bachelor degree will be able to continue their studies in the part-time format of study.

Entrance examinations were held on 30 June 2006. As the number of applicants meeting the requirements was lower than the maximum number of applicants set for admission, all of them were admitted and could enrol in the first year of the follow-up Master degree programme.

The total number of applicants for full time study was 633, 539 of them were admitted. Part-time study in this programme has not been offered yet. All applicants were registered for the study area they had selected. The numbers of applicants and admitted by study areas are in Tab.2.

Table 2: Numbers of applicants and admitted to study areas of the follow-up Master degree programme EECR-M in 2006: Biomedical and Ecological Engineering (M-BEI), Power Electrical Engineering (M-EEN), Electronics and Communications (M-EST), Electrotechnical Manufacturing and Management (M-EVM), Cybernetics, Automation and Measurement (M-KAM), Microelectronics (M-MEL), Power Electrical and Electronic Engineering (M-SVE), Telecommunication and Information Technology (M-TIT)

Study area	*Applicants*	*Admitted*
M-BEI	49	37
M-EEN	47	44
M-EST	102	84
M-EVM	65	51
M-KAM	94	84
M-MEL	46	37
M-SVE	34	31
M-TIT	196	171

Ending Bachelor and Master Degree Programme Electrical Engineering and Computer Science

In 2006, 437 students graduated in the five-year Master degree programme Electrical Engineering and Computer Science, 65 of them in the study area Electrotechnical Manufacturing and Management, 109 in the study area Cybernetics, Automation and Measurement, 199 in Electronics and Communications and 64 in Power Electrical and Electronic Engineering. There are 29 students who will continue their studies in 2007 when they have a last opportunity to complete the ending study programme.

Table 3: Graduates in the study programme Electrical Engineering and Computer Science in study areas Electrotechnical Manufacturing and Management (EVM), Cybernetics, Automation and Measurement (KAM), Electronics and Communications (EST) and Power Electrical and Electronic Engineering (SEE)

Master Study Areas	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
EVM	37	53	37	71	44	65
KAM	64	61	68	67	36	109
EST	108	105	130	132	86	199
SEE	48	72	59	58	33	64
Total	257	291	294	328	199	437

Following the 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. Having completed these courses and earned the prescribed number of credits, the students can enrol in full-time study at FEEC without being required to pass entrance examination, and the earned credits will be recognized. In 2006, there were 47 students in the lifelong education programme.

In the programme for students paying their fees there were 22 international students, 12 in the three-year Bachelor degree programme EECR, 3 students in the two-year follow-up Master degree programme and 7 in the PhD programme.

There has been a consistent effort at the FEEC to use more extensively the information system for management of study affairs (electronic registration and enrolment in courses, electronic recording of study results, study reports, recording of interest in study areas), to simplify administrative work increasing with the growing numbers of students, and made relevant information accessible to students.

Regular assessment of the quality of teaching took place, again with the aid of the faculty information system, and the results were published. In order to increase students´ interest, the questionnaire was innovated in cooperation of vice-deans, student members of Academic Senate, a psychologist and a sociologist.

Work continued on electronic support for part-time Bachelor study and for accreditation of the part-time Master degree programme. Electronic texts were prepared for 65 subjects. For some subjects, electronic texts were created for self-study or for computer and laboratory work. Altogether, 72 electronic texts were created of the total extent of 6,328 pages. For accreditation of the part-time Master degree programme EECR, multimedia and other electronic aids were completed for 21 subjects.

For support of tuition in the Bachelor programme, electronic texts were written for selected professional subjects and humanities, in all 1,551 pages for 16 subjects.

All electronic texts are available on faculty websites to students of each particular degree programme.

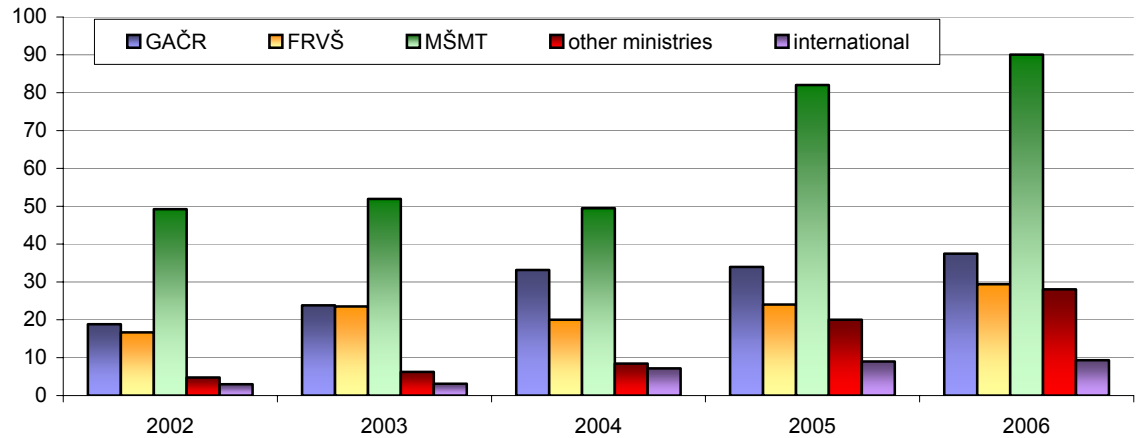
Research and Postgraduate Study

Research

Growth in research was observed in 2006, 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 12%. The major sources were three research plans followed by the Czech Science Foundation projects (GACR) and projects of the Higher Education Development Fund (FRVS).

Results of original research and professional work at FEEC were published in two international monographs and 41 articles in impact journals.



Graph 4: Research funds at FEEC in million CZK, 2002 - 2006

Research Plans, Research Centres

The most significant development and research results in 2006 were achieved by teams involved in three 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 investigated from the viewpoint of system 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 2006 were members of academic staff and postgraduate students from the departments of Microelectronics, Radioelectronics, Control and Instrumentation, Mathematics, Physics, Theoretical and Experimental Electrical Engineering, Electrotechnology and Languages. Also taking part in the research plan were researchers from the Faculty of Mechanical Engineering and the Faculty of Information Technology. There were 46 participants in category D1, 1 in category D2 and 5 in category D3 - 14 professors, 14 associate professors, 20 senior lecturers and 9 lecturers, a technical staff of 23 and 39 full-time doctoral 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: Four different integrated circuits were designed using the AMIS CMOS07 technology, and were sent off for manufacture within the framework of the EUROPRACTICE programme. A microelectronic measuring system for measurement of the electrochemical sensor fluid characteristics, a circuit with active analog elements CDTA a CCTA mainly for use in the current mode were designed, next a testing microelectronic circuit was devised for measurement and testing of various types of integrated circuits bonding in different conditions, targeted at an optimal method of bonding under large currents. For that reason, the chip is equipped with an independent heating system and structures for temperature record. The last prototype is a circuit containing basic systems for implementation of a novel bandpass sigma delta modulator, unique for being used in measurement of capacity pressure sensors.

2. Modelling and simulation of integrated circuits: Calculations of electric field in nanometric systems MOSFET were executed. An analysis was made of short channel effects and of their impact on electric characteristics. For measurement of effects associated with the changes of threshold voltage due to electric bias on electrodes, models of threshold voltage variation were constructed, and algorithms were designed for identification of the electric parameters of systems. The study based on the Landauer-Büttiker approach of electron transport and behaviour of electrons on discrete energy levels in a quantum hole in modulation by high-frequency scalar electric potential or vector electromagnetic potential continued. Work continued on the development of new methods for sensitivity calculations in hybrid electric circuits, with focus on multi-conductor transmission lines. Another focus of interest was the qualitative behaviour of operator dynamic systems.

3. Microsystems and nanosystems: Improvement of the technology for creating thin-film masks with arranged structure of pores and their opening for subsequent deposition of nanostructures. Two types of nanostructure were obtained in filling of nanopores in the mask. Research of thick-film sensors for heavy metal detection focused on utilization of carbon nanotubes for operating electrodes. PZT ceramic pastes for piezoelectric converters in sensors were developed. A new prototype of a device with ´Rotating Vessel´ was tested. Dependences of current response on the position of thick-film sensor related to the vessel rotating in three axes and on revolutions of the rotating vessel. A neural network application method was proposed for non-linear sensor and microsensor data processing. Designed and manufactured was a chip for measurement of specific conductivity of solutions. Development of new types of a nanostructure passivation film deposited by magnetron and of a reactive magnetron sputtering technology for optimization of partial production operations. A device for the LBIC diagnostics of photovoltaic cells. The fundamental parts of the device operating with the measuring method of amplitude analysis, computer processing of results. Optimization of the devised miniature ozone generator was completed. Also completed was the specification of procedures for testing the quality of wireless transmission, connections, testing, measurement and evaluation of signal strength and its effect on the quality of transmitted information and reliability of delivery. Interference characteristics were derived in dependence on Fresnel zones limits and material suppression in the communication parts of the transmitted signal.

4. Advanced microelectronic and nanoelectronic technologies: The temperature characteristics for soldering by remelting with lead-free solders was investigated. Investigated and developed has been a new technique of TLV material and solder deposition by specification. A special device for temperature cycling of test samples by heat stress was implemented. For evaluation of the reliability of lead-free soldering depending on the shape and surface treatment, a testing motive for chip ceramic resistors was designed. Mathematical modeling which can show the overall distribution of thermomechanical stress was used for reliability evaluation in 3D systems. Solar cell assembly and mounting on ceramic substrate was tested. A testing circuit with failure indicating diodes was devised for testing of the solar cell solder joint on ceramic substrate. Investigated and tested was the diffusion of boron paste as a substitute for Ag paste for P-emittor mounting on N-type silicon.

5. Modern diagnostics of materials and components: Research of crystallic CdTe samples and analysis of noise and dependence of noise spectral density on various quantities was carried out. The method of noise separation in bonds and in

samples and in the sample was applied in the technology of ohmic bonds on MOSFET and HEMT. Noise spectroscopy was applied as well as measurement of the third harmonic in electronic components as a diagnostic technique for thick-film resistors. Analysis of 1/f noise in MOSFET systems and CdTe samples continued. Analysis of RTS statistics was performed and the parameters of the exponential division of emission and impingement times were determined. Bragg grid simulation in embedded waveguide channel and in waveguide fin. Theoretical and experimental verification of internal spatial distribution of modes in embedded waveguide, and in the near field over its surface. Measurements of dielectric spectra of material samples continued as well as work on an apparatus for the DRS. A new measurement technique was introduced – spectroscopy of stationary waves - for localization of shifted dielectric boundaries. Reactions taking place in sulphur hexafluoride were investigated by means of plasma processes modeling.

Research results were published in 4 monographs, 35 papers in international journals, 313 papers presented at international and national conferences. There were 9 habilitations and dissertations, and 31 research reports.

In connection with their research work within the framework of the research plan the members of the team were involved in three international projects, 8 GACR projects, 36 FRVS projects,11 projects of the Ministry of Trade and Industry, 3 Academy of Sciences projects, and in 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. The research is focused on multimedia systems from the point of view of transmitted signals, transmission ways and technologies. The research plan is scheduled until 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 2006 were academics and doctoral students of the departments of Radioelectronics, Telecommunications, Biomedical Engineering and Theoretical and Experimental Power Engineering. The investigation team included 12 professors, 23 associate professors, 36 assistant professors and lecturers, a technical staff of 19 and about 80 full-time Ph.D. students.

The research plan covered 6 study areas where the following results were achieved in 2006:

1. New generation wireless and mobile wideband communication systems: The experimental mobile network GSM with support of voice and data services was established. A workplace was set up for measurement of Bluetooth parameters. Measurement of the characteristics of atmospheric environment for optical links, special testing links in Brno and Prague. Development of a transmitter with an avalanche photodiode as a counter of photons. Research of the linearization of power amplifiers by means of digital predistortion. Design of a coded anti-error security system for novel communication systems (WiMAX, UWB). Implementation of a system of joint synchronization and decoding of signals with turbo codes on the signal processor. Enhancement of a statistical model of optical links. Development of a method for assessment of accessibility of an atmospheric optical link under various conditions.

2. Multimedia and hypermedia communication services and technologies: Creating a hierarchical structure of clients for collective reception of multimedia data by means of RTP data streams. Research of compression of mobile images for videoconferencing in DVB-T networks. Application of neural networks and adaptive fuzzy systems for noise suppression in speech in telecommunication networks. Design, implementation and verification of two types of simulators of the real transmission TV channel in the basic and the high-frequency band. Setting-up a workplace for measurement of the characteristics of digital TV signals of the DVB-S, DVB-T a DVB-C standards for automated security of data streams.

3. High-frequency and microwave communication systems: Development and implementation of a phase-carrier controlled oscillator for the AMSAT P3E satellite. Research and development of a wide-band microwave vector analyzer on the principle of hexagon. Development of a time-domain moment-area method for efficient analysis of planar areas, development of a special planar multiband antenna on standard substrates

and ´EM Bandgap´ substrates. Simulation and design of ultrashort power EM pulses. New methods of EM background suppression in measurement of interferences. Design and verification by experiment of a new method for ,measurement of the distance and speed of a satellite with a short pseudorandom sequence. Research of the impact of ionosphere and magnetosphere on satellite communication and ranging. Research and development of the prototype of a special microwave relativistic source with a virtual cathode. Design of a new methodology for estimation of attenuation characteristics of EMC filters in conditions of non-standard impedance.

4. Advanced technologies of integrated communication systems: Concept design of the collective radio network integration with the IP network for the distributed Internet and Intranet environment. Design of a novel security concept for communication systems based on implementation of cryptographic mechanisms into each system element. Methodology of the design of anti-error systems and implementation techniques. Research of two-way information communication technology. Design and implementation of a programming environment for the development of communication systems with background processing support. Cryptographic protection of integrated communication systems.

5. Special electronic circuits and operating blocks for modern communication systems: design of a universal U/I conveyor, development and implementation of prototypes in the CMOS technology. Development of a universal active KHN filter with CDTA elements. Implementation of ultrafast digital blocks in FPGA circuits for linearization of the power stages in transmitters, digital compensation of asymmetry in Q-modulators by FPGA circuits. A new nonlinear oscillator for chaotic signal generation. Research of advanced methods for a symbolical solution of extensive circuits in microelectronic applications. Development of voltage-mode multifunction frequency filters with active UVC elements. Research of new structures for A-D converters. Design and implementation of an IO tester for MOSFET gates for use in sigma-delta converters (in cooperation with the Design Centre AMIS).

6.Digital methods of analysis, processing and transmission of multimedia signals and images:

Research of advanced methods of acquisition, analysis and fusion of mono- and multimodal images, development of fast algorithms for real-time deconvolution of images. Software development for theoretical analysis of the effects of characteristics of transmission TV channels. Applied research of speech signal processing, development of methods for voice transformation man-woman, man-child and vice versa. Methods for processing of time and image signals for elimination of instrument artefacts in 2D imaging techniques. New algorithms for digital processing of musical signals based on physiological and musical acoustics. Detection of stress in speakers by pulse analysis of vocal chords in the speech signal.

Research plan results were published in four scientific monographs, more than 100 articles in international and national journals (11 impact ones), 300 papers at international and national conferences, seminars, workshops. Fifteen engineering works and prototypes were implemented, there were two applications for utility models registration, and 27 partial research and technical reports. There were more than 20 dissertations and habilitations, and two appointments to professorship. The investigation team received 22 responses, 11 of them from abroad.

In connection with their research within the framework of the research plan the members of the investigating team were involved in another five international research and development projects, more than 24 GACR projects, over 60 FRVS projects, 10 projects of the Ministry of Trade and Industry, and more than 20 research and development projects for other institutions.

Resources, Accumulation and Optimization of Electric Energy Exploitation in Conditions of Permanently Sustainable Growth

(investigator: Jiří Kazelle)

The research plan is focused on lead-acid batteries and optimization of their utility characteristics, on explanation of the mechanism of exploitation defects, modeling of currents over electrode surfaces, 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 (signal detection and optimization of observation conditions), research of transport systems based on alternative electric energy sources, exploitation of electric power produced in small water stations for charge of electric vehicles, artificial

intelligence in electromechanical systems and electric drives, identification and optimization of the parameters and design of electric machines using genetic algorithms and simulated annealing, management of electrochemical energy conversion by means of up-to-date method, application of the theory of chaos and fractals to describe non-linear dynamic systems with variable parameters, new fundamental findings related to plasma energy converters , development of methods for electric energy loss allocation due to connecting of dissipated sources, methods for localization of failures in 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 one staff member of the Department of Physics, Faculty of Civil Engineering. In 2006, there were 25 members of the team in category D1, 36 in category D2, 15 in category D3 that is 7 professors, 22 associate professors, 27 assistant professors, 10 Ph.D. students employed at the departments, and technical and administrative staff of 19.

The research plan covered four major areas. The following results were achieved.

1. Chemical sources of electric energy
Preparation of a new ion-exchange membrane and electrocatalysts for H_2-O_2 fuel cells including design of a specified testing technique. Study of the physical and chemical properties of gel polymer electrolytes, their preparation by polymerization using a chemical initiator and UV radiation. NMR spectroscopy-based investigation of lithium and sodium ion mobility in electrolytes. Research of stable and resistant cathode materials for lithium-ion batteries on the basis of $LiCoO_2$ containing dopants. Research of electrochemical insertion of alcalic ions into WO_3 films, mass increase including measurement by means of the QCB technology.

Research of the impact of additives in negative active mass of lead-acid batteries to minimize the negative effects occurring in the long-term PSOC mode. Start of long-term tests with conducting and non-conducting additives. Construction of a mathematical model of current distribution in lead-acid battery electrode systems using calculation on an equivalent electric circuit. Optimization of operating conditions in the EREM specimen chamber for battery mass investigation, design of a humidity measurement technique, work on two signal electron detectors.

2. Optimization of electrochemical electric energy conversion: A mathematical model of a switching reluctance motor. A blocking switching source - structure, function, characteristics, measurement on prototype. Design and implementation of two operating converters for the switching reluctance motor. Two variants with different topology and control software. Implementation of a power converter of extreme parameters: 15 V, 3 kA, 45 kW. Development of a unique matrix transformer, patent application. Implementation and optimization of a generator without slip rings for motor vehicles, a new engine for wipers in service vehicles. Development was started of a new type of EC motor and an axial starter. Research for identification of asynchronous engine defects by measurement of the outer magnetic field was completed. The MKP method for microgenerator magnetic field measurement, optimization calculations. Development has been in progress of a digitally controlled levitation system with a loading capacity of 200 kg, an operating sample has been produced. Development and implementation of a switching power source 10 V, 600 A, 45 kW. Development has been in progress of a three-phase 150 kW alternator for electric traction. Development and implementation of a120 kHz switching source. An operating sample of ceramic commutator was tested. An analysis was performed for optimization of a new series of synchronous generators up to 2,7 MW. Model verification of the dynamic characteristics of electromechanical systems with focus on effects of nonlinearities and changes of parameters, chaos, bifurcation analysis.

3. Optimization of energy conversion and exploitation in systems with ecological power sources
Evaluation of the optimization effect in the operating point of photovoltaic transducers. Noise spectroscopy on new samples of sets G3A, G5 and a set made by alcalic texturation. Simulation of application of the analytical method Fast LBIC and measurement on the prototype. Analysis of measurements at different wavelengths of the LBIC of light source. Modelling of heat transfer in real operating conditions. A detailed analysis of the characteristics of the Stirling thermodynamic cycle. Modelling of a thermoelectric converter. Implementation of a model of heat accumulation with reduced convection. Design of an experi-

mental model of hydrogen accumulator using metahydrides for hydrogen adsorption. Software for computation of the composition and thermodynamic and transport characteristics of gaseous systems. Calculations of the energy balance of optical radiation related to human vision (photometric efficiency) and analysis of new trends in illumination technology and construction of light sources. Modelling of the characteristics of a voltage transformer for simulation of transient effects in electrification systems. A reliability analysis of the distribution network and cost assessment. Implementation of a model of power supply failures in cable distribution networks. An analysis of the characteristics vital for cogenetration unit control.

4. Alternative ecological transport: Capacity measurement on the 660 V Ni-Cd battery composed of110 pieces of 6 V Ni-Cd blocks from the French company SAFT type STM 5.100 MRE, capacity 100 Ah in a low-floor electric bus operated by the company ČAS-SERVICE a.s. Znojmo for Znojmo city transport after 30 000 km. Capacity measurement on the 126 V Ni-Cd battery made of twenty-one 6 V Ni-Cd cells from the French company SAFT type STM 5.100 MRE capacity 100 Ah in the electric vehicle BETA EL 126 operated by the company EPRONA a.s. Rokytnice nad Jizerou after 41 641 km. Capacity measurement on the 180 V Ni-Cd battery made of thirty 6 V Ni-Cd cells from the SAFT type 5,100 MRE capacity 100 Ah in the electric vehicle BETA EL 180 operated by ČAS-SERVICE a.s. Znojmo after 75 565 km. Capacity measurement on the 24 V Ni-MH battery made of twenty Ni-MH cells from the SAFT type VH DL 8500 capacity 8,5 Ah in the electric folding scooter ROTOBIC in the three-track version made by Griesmühle Kleinkraftwerk GmbH, Ottensheim, Austria after 100 cycles. Cooperation with Bank University, London in exploitation of hybrid vehicles driven by combustion engine, in individual and public transport. Application in an international 7th FP EU project ´Efficient and Ecological Rail Vehicles Based on Alternative and Renewable Fuel and Hybrid Drive´.

The research team published 17 papers in impact journals of ISI database, 20 papers in reviewed non-impact journals, 153 papers in conference proceedings. One utility model was created and one patent application submitted. There were 11 prototypes and operating samples, 4 significant software products, 8 research reports, 10 dissertations and a number of less significant papers published in journals and presented at conferences. One member of the team was appointed to professorship, three members of the team in category D1 and two in category D2 were habilitated, and seven members of the team in category D2 defended their dissertations. Three international conferences were organized.

The members of the team participated in 5 GACR projects, 6 FRVS projects, 8 projects of the Ministry of Industry and Trade, one project of the Ministry of the Environment. They also participate in one project of the Faculty of Mechanical Engineering and in a project of the 6th FP EU.

Research Centre of Applied Cybernetics
(Investigator: Petr Vavřín)

Research Centre 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 VSB-TU Ostrava, University of West Bohemia Plzeň, Tomas Bata University Zlín, Institute of Information and Automation Theory, Academy of Sciences Prague, Praha, Institute of Information Technology, Academy of Sciences, 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 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:

1. Automatic control algorithms
P. Vavřín, P. Blaha, P. Václavek

Development continued of intelligent robust algorithms for contactless control of asynchronous engines using the reconstruction state of the system. The algorithms were tested on samples of engines, and results were provided to end users for practical tests. Work on an optimization of the relationship man-machine started.

2. Artificial intelligence and robotics
F. Šolc, L. Žalud, T. Neužil, L. Kopečný, J. Hrabec

The robotic system Orpheus-X2 was further improved. The ARGOS universal system for telepresence control of mobile robots was expanded in order to enable simultaneous control of a number of robots. An independent testing platform Orpheus–EB for visual telepresence was designed. It was presented and tested in the USA at the prestigious Rescue-Robot Excercise No.3 event. The system was also tested on a 9-meter helium airship and on the American robotic system TALON. More information www.c-a-k.cz.

3. Computer Vision
J. Honec, P. Honec, P. Petrovský,. S. Valach

The research team focused on automatic processing of optical data, and achieved outstanding results in installation of their camera systems for traffic surveillance. Research of methods applicable for measurement of the speed and type of a vehicle on the basis of recorded images. Development of specific HW for such applications continued.

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

The main interest of the team is transmission of measuring and control signals in industrial environment. In 2006, comparatory studies were completed for various industrial systems, including employment of Internet for remote control, and applicability assessment of systems in various types of application.

Summary

In the period 2000-2004, the Centre of Applied Cybernetics achieved remarkable results, in both theory and applications. In 2005 and 2006, research was conceived as a continuation of the previously completed work. The Brno branch is fully involved in all four research areas covered by the Centre, the members of the team participate in all activities and events and contribute to the overall results acknowledged by the national and international scientific community (mainly IFAC)

Research centre of quasioptical systems and terahertz spectroscopy

(Investigator: Zbyněk Raida)

Research centre of quasioptical systems and terahertz spectroscopy (KVASTES) was established in March 2006 by the High School of Chemistry and Technology, J. Heyrovsky Institute of Academy of Sciences, Czech Technical University and Brno University of Technology. The centre is involved in basic research funded by the Ministry of Education, project No. LC06071.

The centre is focused on basic research of the structure and dynamics of molecules, relaxation processes, and atmospheric response to electromagnetic waves. The research involves a broad frequency band, ranging from centimetre to submillimeter waves.

The centre KVASTES deals with three major tasks:

- derivation of the structural, dynamic and electromagnetic properties of molecular species based on results of experiments in high resolution millimeter and submillimeter spectroscopy.
- Modeling of tropospheric and stratospheric information interfaces with focus on attenuation characteristics
- Improvement of the spectroscopic quasioptical system (spectrum range, measurement sensitivity and precision, calibration)

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

In 2006, the Brno branch achieved the following results:

- The Kramers-Kronig relations were analyzed and their application described for calculation of the parameters of gases from their absorption spectra.
- Special numerical procedures for solution of integral equations were devised for unstable phenomena (the so called time-domain solution)
- Optimized numerical models were constructed of dielectric and metal lenses for improved focusing of waves radiated by a funnel-shaped antenna into the spectroscope cell.
- An optimized numerical model was completed of a funnel-shaped antenna with the so called double ridge-horn for radiation of a unimodal wave in an extremely wide frequency band (33-300 Hz).

- Development of a numerical model of wave radiation in the spectroscope cell was started, based on the geometrical optical principle.

In the following year, the centre will concentrate on modelling the wave part of the spectroscope as a whole, on global optimization of this part of spectroscope and on modelling and optimization of the spectroscope multiple reflection cell.

Research centre ´Data, algorithms, decision-making´

(Brno group investigator: Jiří Jan, co-investigators: Radovan Jiřík, Radim Kolář)

The following partial, applicable results were achieved in |2006

Ophtalmological images:

Software for recording and visualization of ophtamological images for enhancement of glaucoma diagnostics.

The program is used for multimodal recording of retina images. There are colour digital images and intensity and topographic images from a confocal scanning ophtalmoscope. The recording algorithm is based on the multiresolution principle using affine transformation and mutual information. We used the Powell method and the 'controlled random search' method as an optimization algorithm. As the software is generally applicable, a whole range of optimization parameters can be selected. Other program functions are the real colour 3D-vizualization of an optical disk surface, manual marking of its boundary and 3D plotting. Work has been in progress on functions for import and export of images and contours into/out of the Heidelberg Eye Explorer software for management and fundamental analysis of intensity and topographic images.

Ultrasound tomography:

Estimates of attenuation maps based on direct radiation of ultrasound beams of ultrasound tomography.

Designed and implemented was a set of algorithms for processing of radiofrequency signals detected by ultrasound tomography. The output is a 2D image of the distribution of ultrasound attenuation coefficient of scanned tissue (e.g. breast tissue in mammography). The algorithms entail various approaches to the problem posed as an inversion Radon transformation. Algebraic reconstruction techniques are applied. The problem is, therefore, tackled as two basic problems: setting of a predetermined system of linear equations (corresponding to the system of individual projections), and solution. Results for simulated data are in agreement with reference tissue models. Results for real measurements are only qualitative (a close copy of object structure) Agreement in quantitative values has not been reached yet as there are no suitable artificial reference objects (tissues) available. The resulting set of algorithms (in the Matlab environment) is an entity suitable for experiments with measured and simulated data in a format corresponding to the experimental 2D tomograph in the cooperating Forschungszentrum in Karlsruhe, Germany.

Habilitations and Appointments to Professorship

In 2006, one member of FEEC staff was granted the title of professor and five new associate professors were appointed:

Prof. Ing. Stanislav Hanus, CSc.
Electronics and Communications

Doc. Ing. Ludvík Bejček, CSc.
Technical Cybernetics

Doc. Ing. Pavel Koktavý, Ph.D.
Power Electrical and Electronic Engineering

Doc. Ing. Aleš Prokeš, Ph.D.
Electronics and Communications

Doc. Ing. Pavel Václavek, Ph.D.
Technical Cybernetics

Doc. Ing. Luděk Žalud, Ph.D.
Technical Cybernetics

Postgraduate Study

In academic year 2006/07, there are 331 students in the doctoral study programme. Among them 7 students are in the study programme in English, and one international student receives government scholarship. Numbers of Ph.D. students in individual years of study over the past six 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 2006 can be found on FEEC websites, links *Study*, *Doctoral study programme*, *Doctoral programme graduates*.

Table 4: Numbers of postgraduate students 2002 - 2006

Year	*2002*	*2003*	*2004*	*2005*	*2006*
1.	76	96	87	49	83
2.	59	70	80	71	44
3.	44	57	65	72	67
4.	41	31	48	44	48
5.	25	32	27	33	32
6.	33	31	28	24	29
7.	33	25	31	24	28
Total	**311**	**342**	**366**	**317**	**331**

Student Creativity

STUDENT EEICT Conference and Competition was jointly organized by FEEC and FIT on 27 April 2006. 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 243 papers, 66 Bachelor, 82 Master and 95 doctoral papers.

Competition papers were evaluated by expert committees including representatives of sponsoring companies, academics and Student Union representatives. Top sixty papers were awarded at the closing ceremony.

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

Table 5: Doctoral programme graduates at FEEC departments 2002- 2006

	2002	*2003*	*2004*	*2005*	*2006*	*Total*
UAMT	2	4	8	3	3	**20**
UBMI	1	1	2	2	0	**6**
UEEN	1	0	6	1	5	**13**
UETE	3	2	0	3	2	**10**
UFYZ	2	0	1	1	0	**4**
UMEL	4	1	3	8	4	**20**
UREL	1	3	1	9	10	**24**
UTEE	0	1	1	2	4	**8**
UTKO	1	11	4	4	10	**30**
UVEE	8	6	3	4	6	**27**
Total	**23**	**29**	**29**	**37**	**44**	**162**

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 university Department of International Relations responsible for economic support and organization of international programmes, e.g. the Socrates programme. As a result, 25 students could study abroad in the extent of 146 student/months, and 37 teachers were on lecture stays at the length of 36 weeks, (see Table 6). 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.

Reciprocally, there has been an increased interest of international students. Within the Socrates programmes there were 21 students coming for placements in the total extent of 104 months, which represents an increase by 24% of student/month in comparison with 2005. Mobility figures for incoming and outgoing students in individual programmes for 2006 are in Table 7. Existing agreements in the Socrates-Erasmus programme were renewed. On the whole, the faculty has concluded 46 bilateral agreements. A list of universities cooperating with FEEC on the basis of Socrates-Erasmus agreements for academic year 2006/07 is given in Table 9.

In 2006, 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 420,000 CZK. Further financial support from these programmes was provided directly to students via the Department of International Relations of Brno University of Technology.

The Faculty has obtained another Development program - ´Success in Master and Doctoral Degree Programmes´ including mobility support. The total amounts used to cover travel expenses of Master and Ph.D. students were 580 thousand CZK and 1,160 thousand CZK, respectively. Within the framework of the Development programme of the Ministry of Education, 18 students went to study abroad in the extent of 64 student/months, which is an increase by 52% in student/months in comparison with 2005.

Mobility trends in outgoing and incoming students over the past three years are shown in Table 8.

Cooperation is supported of FEEC departments and academics with institutions abroad based on interfaculty and Socrates-Erasmus agreements as well as newly established contacts. In 2006, the amount of 720,000 CZK was provided in support of such activities.

Another 870,000 CZK was provided in support of international activities. The development in funding over the past three years is shown in graph 5.

Table 6: Student and teacher placements in Socrates/Erasmus programme 2002-2006

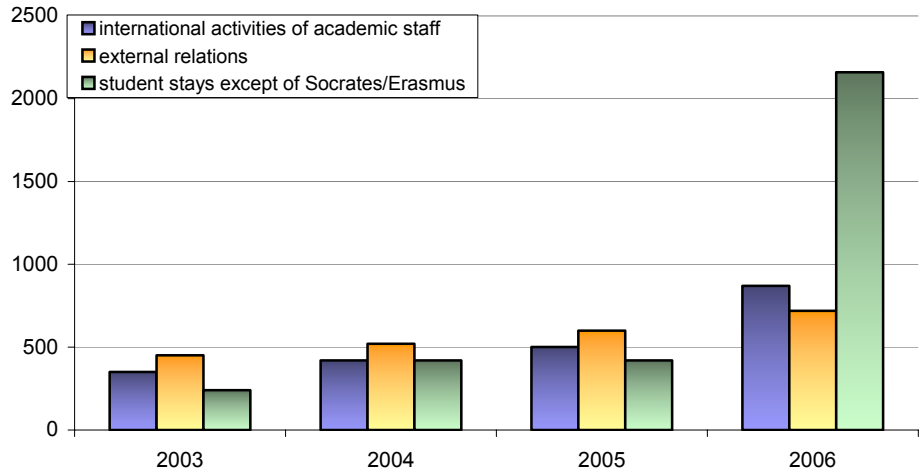
Socrates-Erasmus	*2002*	*2003*	*2004*	*2005*	*2006*
Students	41	29	42	45	25
Months	201	128	165	161	146
Lecture stays	13	23	28	26	37
Lecture weeks	13	25	38	30	45

Table 7: Student placements at FEEC and abroad within the framework of various programmes in 2006

Activity	*Incoming students*		*Outgoing students*	
	Students	*Months*	*Students*	*Months*
Socrates-Erasmus	21	104	25	146
CEEPUS	2	4	-	-
Leonardo	4	10	2	11
Inter-university agreements	3	3	-	-
Development programme of Ministry of Education	-	-	18	64
Other	5	5	-	-

Table 8: Student placements at FEEC and abroad in all mobility programmes 2004-2006

		2004	*2005*	*2006*
Arrivals	***Students***	20	36	34
	Months	55	113	125
Departures	***Students***	55	59	45
	Months	191	203	221



Graph 5: Funding of international activities of FEEC staff, faculty international activities and student placements outside the Socrates programme in the period 2003-2006 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 Trojanovice, 24 to 26 May 2006. The meeting dealt with transformation of study programmes of Czech universities based on the Bologna Declaration and with accreditation of new study programmes. Also discussed were results of the 6th Framework Programme, coordination of projects, cooperation in research plans of the 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, Rockwell-Allen JULI Motorenwerke, Škoda Volkswagen Mladá Boleslav, Telecom, Motorola, AMI Semiconductor s.r.o., Schneider Group, Celestica, etc.

Close cooperation of many years has been maintained with the Institute of Instrumentation 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 the 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 for academic year 2006/07

University	***Country***
Katholieke Hogeschool Brugge-Oostende	Belgium
Katholieke Hogeschool Limburg	Belgium
Technični Universitět – Sofia (branch Plovdiv)	Bulgaria
Aalborg Universitet	Denmark
Danmarks Tekniske Universitet Lyngby	Denmark
Kuopion yliopisto	Finland
Tampereen teknillinen yliopisto	Finland
École Supérieure d'Ingénieurs en Electrotechnique et Electronique Amiens	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 di Roma „La Sapienza"	Italy
Universitá degli Studi Salerno	Italy
Universitá degli Studi di Genova	Italy
Fachhochschule Darmstadt	Germany
Fachhochschule Furtwangen	Germany
Berubsakademie Loerrach, Staatliche Studienakademie	Germany
Fachhochschule Pforzheim	Germany
Fachhochschule Wiesbaden	Germany
FernUniversität Hagen	Germany
Friedrich-Alexander-Universitat Erlangen	Germany
Hochschule für Technik, Wirtschaft und Kultur Leipzig	Germany
Technische Universität Dresden	Germany
Technische Universität Magdeburg	Germany
Universitetet i Bergen	Norway
Instituto Politécnico de Lisboa – ISEL	Portugal
Instituto Superior de Engenharia de Coimbra	Portugal
Instituto Politécnico do Porto	Portugal
Technische Universität Wien	Austria
Technická univerzita v Košiciach	Slovakia

Žilinská univerzita	Slovakia
Universidad de Cantabria	Spain
Universidad de Malaga	Spain
Modragon Unibertsitatea	Spain
Universitat de Valéncia	Spain
Universidad de Zaragoza	Spain
Universitat Rovira i Virgili Tarragona	Spain
Högskolan I Halmstad	Spain
Malmö högskola	Sweden
Zonguldak Karaelmas University	Turkey
Coventry University	Great Britain
University of Salford	Great Britain
University of Bournemouth	Great Britain
University of Huddersfield	Great Britain

Academic Senate

In 2006, 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., chairman, EK, UBMI,
Ing Petr Baxant, Ph.D., LK, UEEN
Ing. Petr Fiedler, EK, UAMT
Ing. Ivana Jakubová, PK, UREL
RNDr. Vlasta Krupková, CSc., EK,LK, UMAT
PhDr. Ludmila Neuwirthová, PK, UJAZ
Ing. Radovan Novotný, Ph.D., EK,LK, UMEL
Ing. Helena Polsterová, CSc., PK, UETE
Ing. Miloslav Steinbauer, 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

Petr Polách, chairman
Bc. Radim Bártek
Bc. Soňa Brudná
Michal Karásek
Ing. Kristýna Kubíčková
Jiří Piškula, LK
Tomáš Žabka

Some of the student senators graduated from FEEC during 2006. By-elections were held in October.

Student Chamber since 1 November 2006

Bc. Radim Bártek, EK, chairman
Martin Daniel, EK, LK
Bc. Jiří Hermany
Bc. Irena Hývnarová, LK

Michal Karásek, PK

Ing. Kristýna Kubíčková, PK

Jiří Piškula, LK, EK

Academic Senate held 11 regular meetings and one irregular meeting, with an average attendance of 85%. Academic Senate dealt with legislative, economic and pedagogical issues.

Legislative committee participated in preparation of a draft of new internal faculty guidelines provoked by the issue of a Higher Education Act amendment and the issue of new Brno University of Technology regulations. Draft of the Statute, Academic Senate Rule of procedure and Election decree, and Scientific Board Rule of procedure were approved by Academic Senate in December 2006. Thus , by the end of the year, FEC harmonized all internal regulations with valid laws and regulations. Proposals for Admission Procedure Regulations for all formats of study to come into effect in academic year 2007/08 were discussed.

Legislative committee in cooperation with information system administrators prepared Academic Senate by-elections.

Academic Senate discussed and approved the economic report for 2005 and the proposal for distribution of funds and allotment of education funds.

Academic Senate paid attention to organising of a Pedagogical Conference devoted to the structured form of study to be held at the beginning of the summer semester.

Discussions at the meetings were always constructive as the proposals were first sent to all members and departments for comments in order to avoid revocations of decisions.

Campus Development

The system of cooling and forced air circulation in classrooms and offices in the faculty premises at Kolejní 4 was completed, and the costs were partially covered by departments.

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

Relocation

Reconstruction of premises Purkyňova 118 was started after the Department of Electrical Power Engineering moved out. At the turn of 2005 and 2006, laboratories for the Department of Telecommunications were reconstructed, and new classrooms were built for the department of Radioelectronics. Reconstruction of the 1st floor continued to prepare rooms for the CISCO academy. Shared premises were re-furnished.

Reconstruction at Technická 8

Repairs provoked by ´sinking´ of the building were carried out. Jacketing of the building was prepared during 2006, and will start at the beginning of 2007.

Reconstructions at Údolní

In building U1, new flooring was laid, walls and doors were painted, the access system was innovated. In building U2, the water distribution system was reconstructed. The main entrance to the premises was equipped with a chip card system, and surveillance cameras were installed.

Construction Works

Preparations for construction of a new building at Technická 10 continued.

Competition for selection of project preparation supplier and the general supplier was announced.

Computer Network and Information Systems

Priority was given to:

- upgrading of servers at premises Brno-centre and Brno-north,
- strengthening of the network of Gb information and communication technologies
- network backup
- preparation for replacement of existing access systems at Kolejní 4, and on the 5th and 6th floors of block A3 at Technická 2 started in connection with transfer to Myfare chip cards.
- innovation and administration of faculty websites

Information Systems and Services

The Faculty considered transfer to the university information system Apollo, and started negotiations and analyses of the system modules as compared with the used faculty information system. Consequently, work on the development of the faculty system using the Mambo technology will be stopped. Attention will be focused on defining faculty requirements for Apollo adaptations.

Other

Equal Opportunities at FEEC

The ´Consultancy and Information Gender Studies Centre´ was set up at the faculty in 2003 with support from the Higher Education Development Fund, and continued its activities in 2006.

The Centre provides consultancy, professional and personal, 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.

However, equal opportunities can be understood in a broader sense. In 2006, the Centre focused on equal opportunities in education of handicapped students.

The Centre also concentrates on integration of handicapped students in full-time and part-time study programmes.

The Centre pays attention to promotion of study opportunities for handicapped students, development of contacts with selected secondary schools integrating handicapped students, and to creating conditions considering the specific needs of such students.

The Centre cooperates with the Department of Physics, the Student Union and other faculty 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 to national and international scientific community.

The Institute groups the 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:
Doc. Ing. Miroslav Kasal, CSc. (UREL), Doc. Ing. Zdeněk Malec, CSc. (UAMT), Prof. Ing. Zdeněk Smékal, CSc. (UTKO), Prof. Ing. Vladimír Šebesta, CSc. (UREL), Ing. Robert Vích, DrSc., Dr.h.c. (Academy of Sciences)

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Student Union

As at every university, Student Union is active at FEEC. It is a democratic organization with voluntary membership, striving for faculty and higher education development as well as for personal development of each student. Student Union cooperates with Academic Senate of FEEC and Academic Senate of Brno University of Technology in handling both short-term problems and long-term tasks. Student Union is a partner to the faculty leadership in an effort to maintain communication and information exchange.

Students are informed on Student Union websites, noticeboards, leaflets or by e-mail. Student Union takes care of questionnaires providing the faculty with feedback from students.

Student Union members take active part in faculty life. The students get used to teamwork and to project management methods. They participate in negotiations and joint projects with faculty leadership and other institutions and companies (secondary schools, other universities, sponsors) and student organizations. They have opportunity to obtain experience for their future careers.

In 2006, Student Union took part in organizing welcoming information lectures for first-year students where they were acquainted with ´student views´ of the life at faculty and in Brno. The Union participates in preparation of the EEICT competition where student representatives are members of the jury. The faculty ball was nearly solely organized by the students. The Student Union helped with promotion of the faculty at the GAUDEAMUS fair and with organization of Open Door Days. Also organized were meetings with faculty leadership where the students´ and faculty needs are discussed. On request of students, a university-wide exchange of lecture notes was organized.

Student Union has launched the project ´Cooperation with Industry´ aimed at offering the students an opportunity to meet representatives of companies, Czech and international, take part in excursions and make contacts resulting in temporary work or permanent jobs.

Department of Control and Instrumentation

Prof. Ing. Pavel Jura, CSc.

Head

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

Associate Professors

Doc. Ing. Ludvík Bejček, CSc.
Doc. Ing. Petr Beneš, Ph.D.
Doc. Ing. Jozef Honec, CSc.
Doc. Ing. Václav Jirsík, CSc.

Lecturers

Ing. Zdeněk Bradáč, Ph.D., 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. Michal Polanský, Ph.D., Ing. Miloslav Richter, Ph.D., Ing. Soňa Šedivá, Ph.D., Ing. Radek Štohl, Ph.D.

Postgraduate Students

Ing. Jan Beran, Ing. Luděk Černý, Ing. Jiří Dohnal, Ing. Jolana Dvorská, Ing. Petr Fidler, Ing. Michal Gajdušek, Ing. Zdeněk Havránek, Ing. Peter Honec, Ing. Karel Horák, Ing. Jakub Hrabec, Ing. Michal Hrouzek, Ing. Ondřej Hynčica, Ing. Luděk Chomát, Ing. Jan Chovanec, Ing. Ondřej Jež, Ing. Michal Jurosz, Ing. Peter Kacz, Ing. Ilona Kalová, Ing. Zdeněk Kaňa, Ing. Jiří Keprt, Ing. Michal Knotek, Ing. Tomáš Kopecký, Ing. Lukáš Kopečný, Ing. Miroslav Krupa, Ing. Přemysl Kučera, Ing. Marek Kváš, Ing. Ondřej Lebeda, Ing. Marek Lisztwan, Ing. Vlastimil Lorenc, Ing. Vojtěch Mikšánek, Ing. Vojtěch Němec, Ing. Petr Nepevný, Ing. Tomáš Neužil, Ing. Lubomír Novák, Ing. Petr Petyovský, Ing. Ondřej Pinkava, Ing. Petr Polách, Ing. Václav Sáblík Ing. Michal Schmidt, Ing. Pavel Střítecký, Ing. Jaroslav Šembera, Ing. Soběslav Valach, Ing. Jan Valenta, Ing. Petr Vaňous, Ing. Michal Vašina, Ing. Václav Veleba, Ing. Libor Veselý, Ing. Miloš Veselý, Ing. Pavel Zbranek

Administrative and Technical Staff

Ing. Luděk Anděra, Ing. Petr Blaha, Ph.D., Bc. František Burian, Ing. Pavel Kučera, Ph.D., Ing. Jan Pásek, CSc., Lenka Petrová, Ing. Pavel Václavek, Ph.D., Jan Vodička, Miloš Zbořil, Ing. Luděk Žalud, Ph.D.

Main Interests

The group involved in research of automatic control continued with the development of intelligent algorithms for control of electrical drives, mainly sensorless control and identification of asynchronous motor parameters. Cooperation agreement was concluded with the company Freescale Semiconductor. Direct implementation of heterogeneous control algorithms, real-time communication and control in the environment of the development system Matlab/Simulink and programmable automata are the main interests of the team.

The group of computer vision concentrates on solutions related with orders from the industrial sector (AVX, Pegas, Police of the Czech Republic, Metra Blansko, VF, Volkswagen, APOS-TRADE). The team cooperates with academic institutions (Faculty of Information Technology, Brno University of Technology, Czech Technical University, Stanford University). Instruction is focused on solutions of industrial applications in computer vision. Research and instruction laboratories were specially equipped for dealing with such tasks.

The group of robotics and artificial intelligence continues work on the robotic system Orpheus-X2. Its electronic part was substantially upgraded. An independent electronic unit of the system called Orpheus-EB was devised for experiments with visual telepresence on other systems.

The group of measurement technology was involved in research of the measurement of parameters of electromechanical systems, sensors and sensing measurement technology, measurement automation, data acquisition and processing, diagnostic technology (vibration, acoustic and temperature).

The group of industrial automation centred on applied information and communication technology for automation tasks. The team focused on the development of industrial Ethernet systems and wireless technology (particularly the ZigBee technology) for automation purposes, and related issues of safety, reliability, protection and operation of communication and control systems in real-time.

Major Achievements

In 2006, an advanced algorithm for asynchronous motor sensorless control was implemented and verified on an operating sample. Results were published in VÁCLAVEK, P., BLAHA, P. Lyapunov-Function-Based Flux and Speed Observer for AC Induction Motor Sensorless Control and Parameters Estimation. IEEE T Ind Electron 2006; 53(1):138 - 145.

Verification applications of neural networks in short sampling periods. Results were published at the IEEE conference ICARCV 2006.

The group of computer vision participated in the development of: a control system prototype (Metra Blansko), visual systems (AVX Lanškroun), a periscope into ionizing radiation chamber (VF Černá Hora), micropoint reading device (APOS-TRADE), a graphic generation system (VW AG), a control system for nuclear physics laboratory at Stanford University. Results were published at international conferences IFAC held in the Czech Republic and IMAGEComp held in Portugal. Development of the robotic system Orpheus-X2. The system Orpheus was presented at the prestigious event SSRR06 and Rescue Robot Demo #3, Washington, USA on invitation of the American NIST association.

Development, implementation and verification of operating samples of a four-cell thermal probe for temperature measurement in the range 0-260 °C, for SENSIT s.r.o. Rožnov p. Radh. In cooperation with the Faculty of Mechanical Engineering, expertise in the rolling mill Třinec. Co-organizing the conference Temperature Measurement and Regulation in Theory and Practice to be held in 2007. In cooperation with the Czech Technical University, Faculty of Electrical Engineering, the monograph „Měření průtoku a výšky hladiny“ (Measurement of the Flux and Height of Level), BEN, ISBN 80-7300-156-X. Laboratory of control industrial systems Siemens. The Rockwell company innovated the laboratory of programmable automatics Allen-Bradley. Work continued on the project of the 6th FP EU ´Virtual automation network (VAN)´.

Major Research Projects

Intelligent Control Algorithms of 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

Wireless Technology ZigBee in Decentralized Control Systems – GAČR 102/05/0663
Investigator: František Zezulka

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

A Digital Video-Sensoric System for Rescue Robots– AV ČR 1ET100750408
Investigator: Luděk Žalud

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

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

TALENT – Coordinated Instruction of Doctoral Degree Students in Control Technology and Robotics – GAČR 102/03/H116
Investigator: Vladimír Kučera, co-investigator Petr Vavřín

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

Development of Operation and Control Technology for Radionuclide Sources - FD-K3/106
Investigator: Zdeněk Bradáč

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

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

Selected Publications

FIEDLER, P., KUČERA, P., BRADÁČ, Z., HYNČICA, O., KACZ, P., VRBA, R. Embedded Computer Systems: Architectures, Modeling, and Simulation:. Chapter: On Security of PAN Wireless Systems. Berlin / Heidelberg, SRN: Springer, 2006. pp. 178 - 185. ISBN 3-540-36410-2

VÁCLAVEK, P., BLAHA, P. Lyapunov-Function-Based Flux and Speed Observer for AC Induction Motor Sensorless Control and Parameters Estimation. IEEE Transactions on Industrial Electronics, ISSN 0278-0046, 2006, vol. 53, no. 1, pp. 138 - 145.

HAVRÁNEK, Z. Modal analysis of vibrating steel beam by acoustic holography method. WSEAS Transactions on Signal Processing, ISSN 1790-5022, 2006, vol. 8, no. 2, pp. 1130 - 1 135.

ZEZULKA, F., BRADÁČ, Z. Immune network control for stigmergy based foraging behaviour of autonomous mobile robots. Wiley InterScience, ISSN 1099-1115, 2006, vol. 2006, no. 9, pp. 1 - 22.

ŽALUD, L., KOPEČNÝ, L., NEUŽIL, T. ARGOS - ORPHEUS-X2 User Interface. WSEAS Transactions on Systems, ISSN 1109-2777, 2006, vol. 5, no. 4, pp. 864 - 869.

Bachelor's 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 (František Šolc)
Industrial automation (František Zezulka)
Measurement in electroengineering (Ludvík Bejček)
Measurement of physical quantities (Ludvík Bejček)
Microprocessors (Tomáš Macho)
Modeling and Simulation (František Šolc)
Modern means in automation (Václav Jirsík)
PCs in Instrumentation. (Miloslav Čejka)
PC systems (Jozef Honec)
Practical programming in C++ (Miloslav Richter)
Professional Practice (Václav Jirsík)
Programmable logics controllers (František Zezulka)
Signals and systems (Pavel Jura)

Master's Programme

Artificial Intelligence (Václav Jirsík)
Computer Vision (Jozef Honec)
Construction of Measuring Instruments (Petr Beneš)
Design of Control Systems (František Zezulka)
Distributed systems and networks (František Zezulka)
Electronic Measurement Technics (Miloslav Čejka)
Embedded systems for industrial control (Zdeněk Bradáč)
Fuzzy systems (Pavel Jura)
Laboratory Instruments. (Ludvík Bejček)
Logical systems (Radovan Holek)
Machine Learning (Václav Jirsík)
Measurement in no-el. Quantities (Ludvík Bejček)
Modelling and Identification (František Šolc)
Multivariable Signal Processing (Jozef Honec)
Operating Systems and Networks (Tomáš Macho)
Optimalization of controllers (Petr Pivoňka)
Optoelectrical sensors (Ludvík Bejček)
PCs in Instrumentation (Miloslav Čejka)
Process automation (František Zezulka)
Professional Practice (Václav Jirsík)
Robotics (František Šolc)
Robust and algebraic control (Petr Pivoňka)
Semiconductor and Smart Sensors (Petr Beneš)
Sensors of nonelectrical Quantity (Ludvík Bejček)
Signal Processors in Automation and Measurement (Jozef Honec)
Smart and Semiconductor Sensors (Petr Beneš)
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 Drives Control (research and development of intelligent control of electrical drives, Pavel Václavek)

Laboratory of Intelligent Controllers (instruction and research in continuous and discrete physical models, design and verification of identification and control algorithms on principles of artificial intelligence, development and verification of controllers, Petr Pivoňka)

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

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

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

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

Laboratory for Measurement of Non-Electrical Quantities (instruction in Measurement of Non-Electrical Quantities, Sensors of Non-Electrical Quantities, experiments for student projects, diploma theses and research projects, Petr Beneš)

Laboratory of Optoelectronics (instruction in Optoelectronics in Measurement and Automation Technology, experiments for student projects and diploma theses and research projects, Stanislav Klusáček)

Laboratory of Electronic Measurement (instruction in Measurement in Electrical Engineering and Electronic Measurement, Marie Havlíková)

Laboratory of Measurement Automation (instruction in Measurement Automation, experiments for student projects, diploma theses and research projects, Miloslav Čejka)

Laboratory of Acoustic Emission and Vibrodiagnostics (research laboratory, experiments for student projects, diploma theses and research projects, Petr Beneš)

Laboratory of Pressure and Flux Measurement (research laboratory, evaluation track for flux measurement, Ludvík Bejček)

Laboratory of Temperature Measurement (research laboratory, experiments for student projects, diploma theses and research projects, Ludvík Bejček)

Laboratory of Industrial Automation and Control Systems of Siemens (computer control of physical models using Ethernet and USB for communication between a PC and remote V/V units, safe programmable automatics Simatic S7-300, communication on PROFINET, Radek Štohl)

Laboratory of Control Systems of Rockwell (SLC 500, Control Logix and Compact Logix, Flex I/O, DH and DH+, DeviceNet and industrial Ethernet/IP, Petr Fiedler)

Department of Biomedical Engineering

Prof. Ing. Jiří Jan, CSc.
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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

Ing. Jana Bardoňová, Ph.D., Ing. Miroslav Dvořák, CSc., Ing. Petr Fedra, Ing. Karel Jehlička, CSc., Ing. Radovan Jiřík, Ph.D., Ing. Radim Kolář, Ph.D.

Postgraduate Students

Ing. David Čermák, Ing. Tomáš Červinka, Ing. Martin Čížek, Ing. Adam Filipík, Ing. Ferdinand Hodáň, Ing. Jan Hrubeš, Ing. Lukáš Chmelka, Ing. Dina Kičmerová, Ing. Libor Kubečka, Ing. Pavel Leinveber, Ing. Michal Mikl, Ing. Martin Plchút, Ing. Jiří Roleček, Ing. Milan Rychtárik, Ing. Ivo Říha, Ing. Jiří Sekora, Ing. Petr Sadovský, Ing. Martin Švrček, Ing. Viktor Svoboda, Ing. Milan Tannenberg, Ing. Petr Verner, Ing. Roman Vopálka, Ing. Jiří Začal, Ing. Roman Žák

Administrative and Technical Staff

Mgr. Dušan Hemzal, Ph.D., Anna Oujeská, Mgr. Igor Peterlík, Jaroslav Sedláček, Ing. Vlastimil Václavík

Main Interests

The department provided tuition in basic subjects, mainly processing of signals and images, and specialized subjects of biomedical and ecological engineering in the new and the ending 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 were digital processing and analysis of cardiological signals and ophtalmological images (digital processing and analysis of electrical activity of ischemic heart) and ophtalmological images and ultrasonographic data. The department has closely cooperated with the Ophtalmological Clinic of Friedrich- Alexander-University Erlangen, Forschungsinstitut Karlsruhe, University of Bergen, Medical Faculty of Masaryk University Brno, the Faculty Hospital in Brno-Bohunice, and other institutions.

Research carried out in the research centre D.A.R. focused 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 the research plan (investigator Professor Svačina and by national grant projects for modelling of the origin and analysis of cardiological electric signals, including a further development of a unique apparatus for simultaneous record of heart activity by optical and electrical methods for detection of by-effects of medicines. Research laboratories will be upgraded and used for tuition, with priority given to talented students.

The department concentrates on the development of the new Master programme in the study area Biomedical and Ecological Engineering, and on completion of an instruction laboratory of multimedia signals and data. The department´s activities are centred on preparation of a new Bachelor degree programme Biomedical Engineering and Bioinformatics. Research and computer laboratories are gradually upgraded, namely the laboratory of clinical technology for teaching biomedical subjects, with instruction in diagnostic procedures, and laboratory of physics.

Major Achievements

The members of the staff were involved in several research projects. Their results were published in scientific journals and in a monograph, and presented at leading international conferences. In 2006, research in the division of the national research centre D.A.R.(Data-Algorithms-Decision-Making, coordinator ÚTIA of Academy of Sciences Prague) was focused on analysis and vision of images.

Ivo Provazník was appointed professor, and thus the average age of professors at the faculty was decreased. Jiří Kozumplík was habilitated. Young members of the staff are gradually recruited from our best Ph.D. graduates.

The year 2006 was the second year of tuition in the new Master degree study area Biomedical and Ecological Engineering. The number of students interested in the programme was relatively high.

The biannual conference BIOSIGNAL 2006 was held in 2006. It is regularly organized under the auspices of the European Association EURASIP and the world organization IEEE EMBS. The department was the chief organizer of the conference chaired by Professor Jan. Professor Provazník was chairman of the steering committee. The conference has been for many years recognized as a reputable event among the international community in our field of science, which is a significant achievement.

In 2005, the department was invited to participate in the European project EVICAB (European virtual campus for e-learning in biomedical engineering) which was given a European Commission grant. In 2006, the department participated in preparation of the study programme Biomedical Engineering and Bioinformatics (chief investigator Prof. Jan, investigators Radovan Jiřík a Radim Kolář) and in logistics for the virtual campus.

Of crucial importance for the development in our field of science and at our department was accreditation of the Bachelor degree programme Biomedical Engineering and Bioinformatics headed by Professor Provazník, who obtained, together with the cooperating faculties, a development project of the Ministry of Education which helped to upgrade and enlarge the department´s laboratories.

Major Research Projects

EVICAB - European Virtual Campus for Biomedical Engineering – EU ELE-ELEB12
Investigator: Jiří Jan

Modulation Role of Sigma Signalling on Electromechanical Relations of Isolated Cardiomyocytes and Heart – GAČR 305/04/1385
Co-investigator: Ivo Provazník

Optical Recording of High-Resolution Action Potentials for Analysis of T- wave Alternations of EKG Signal - GAČR 102/04/0472
Investigator: Ivo Provazník

Computer-Aided Glaucoma Diagnostics Based on an Analysis of Multimodal Images – D-CZ 23/05-06
Investigator: Jiří Jan

Design of Algorithms for Reconstruction of High-Resolution Images in Ultrasound Tomography– D-CZ 22/05-06
Investigator: Radovan Jiřík

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

Selected Publications

JIŘÍK, R., TAXT, T. High-Resolution Ultrasonic Imaging Using Fast Two-Dimensional Homomorphic Filtering. IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, ISSN 0885-3010, 2006, vol. 53, no. 8, pp. 1440 - 1 448.

PÁSEK, M., ŠIMURDA, J., CHRISTÉ, G. The functional role of cardiac T-tubules explored in a model of rat ventricular myocytes. Philosophical Transactions of the Royal Society, ISSN 1364-503X, 2006, pp. 1187 - 1 205.

HONZÍKOVÁ, N., LÁBROVÁ, R., FIŠER, B., MADĚROVÁ, E., NOVÁKOVÁ, Z., ZÁVODNÁ, E., SEMRÁD, B. Influence of age, body mass index, and blood pressure on the carotid intima-media thickness in normotensive and hypertensive patients. Biomedizinische Technik, ISSN 0013-5585, 2006, vol. 51, no. 4, pp. 159 - 162.

HONZÍKOVÁ, N. Analyses of cardiovascular oscillations for enhanced diagnosis and risk stratification in cardiac diseases and disorders. Biomedizinische Technik, ISSN 0013-5585, 2006, vol. 51, no. 4, pp. 276 - 278.

HONZÍKOVÁ, N., NOVÁKOVÁ, Z., ZÁVODNÁ, E., PADĚROVÁ, J., LOKAJ, P., FIŠER, B., BALCÁRKOVÁ, P., HRSTKOVÁ, H. Baroreflex sensitivity in children, adolescents, and young adults with essential and white-coat hypertension. Klinische Padiatrie, ISSN 0300-8630, 2006,vol. 218, no. 4, pp. 237 - 242.

CHRÁSTEK, R., KUBEČKA, L., JAN, J. Towards automated diagnostic evaluation of retina images. Pattern Recognition and Image Analysis, ISSN 1054-6618, 2006, vol. 2006, no. 4, pp. 671 - 676.

JÍRA, M., ZÁVODNÁ, E., HONZÍKOVÁ, N., NOVÁKOVÁ, Z., FIŠER, B. Baroreflex sensitivity as an individual characteristic feature. Physiological Research, ISSN 0862-8408, 2006, vol. 53, no. 3, pp. 349 - 351.

Bachelor's Programme

Computers and Programming 1 (Ivo Provazník)

Digital Signal Processing and Analysis (Jiří Jan)

Ecology in electrotechnical profession (Jiří Rozman)

Human biology (Nataša Honzíková)

Introduction to Medical Informatics (Ivo Provazník)

Medical diagnostic devices (Radim Kolář)

Multimedia signals and data (Jiří Jan)

Therapeutic and prosthetic instruments (Jiří Rozman)

Master's Programme

Advanced methods of signal processing (Jiří Jan)

Analysis of Signals and Images (Jiří Jan)

Biological system modelling (Radovan Jiřík)

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 the bio- and ecosystems (Milan Chmelař)

Ecological engineering (Jiří Rozman)

Healthcare (Jindřich Vomela)

Human biology (Nataša Honzíková)

Introduction to environmental studies (Hana Librová)

Medical Information Systems (Ivo Provazník)

Medical systems design (Karel Jehlička)

Multirate Systems (Jiří Kozumplík)

Special devices for healthcare and ecology (Jiří Rozman)

Tomographic imaging systems (Aleš Drastich)

Traditional medical and ecological 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 Diagnostic Systems (instruction in Medical Diagnostic Technology, Diagnostics of Bio and Ecosystems, Conventional Imaging Systems, Tomographic Imaging Systems, Ecology in Electrical Engineering, experiments in research and student projects, Radim Kolář)

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

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

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

Laboratory of Digital Signal and Image Processing (instruction in Digital Signal Processing and Analysis, Multimedia Signals and Data, Analysis of Signals and Images, Advanced Methods of Signal

Processing, Multicycle Systems, Computer and Programming I, Computer and Programming 2, Petr Fedra.)

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

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

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

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

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

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

Department of Electrical Power Engineering

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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. Michal Chmela, 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. Michal Bernard, Ing. René Borek, Ing. Petr Čambala, Ing. Daniel Foltýn, Ph.D., Ing. René Kameník, Ing. Milan Krátký, Ing. Jan Macháček, Ing. Jiří Malý, Ing. Zdeněk Matoušek, Ing. Tomáš Mendl, 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

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

Research was 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, and other. Cooperation focused on research and instruction continued with departments of power electrical engineering at all Czech and Slovak technical universities

Major Achievements

In 2006, the department organized the 7th International Scientific Conference ´Electric Power Engineering 2006´ with 120 participants, 20 of them from abroad.

There was 1 GACR and 5 FRVS projects. Moreover, the department participated in the research plan ´Resources, Accumulation and Optimization of Electric Energy Exploitation in Conditions of Permanently Sustainable Growth´. An operating sample of a thermoelectrical generator was implemented. The Laboratory of Illumination Technology was upgraded and enlarged within the framework of a FRVS project, and ranks among the top laboratories of spectrometry in the Czech Republic.

Research results were published in reputable scientific journals and in proceedings of national and international conferences.

Our cooperation with the Institute of Plasma Physics of Czech Academy of Sciences continued in the Point Plasma Laboratory focused on experimental research on a unique gas modular plasmatron designed by the department. Cooperation with EGU Brno centred on connecting wind-powered stations into the electrification system. In cooperation with the company E.ON a static power supply station for the department´s laboratories was built. Five Ph.D. theses were defended during 2006. The Ph.D. thesis of Ilona Lázničková received the Werner von Siemens Excellence Award 2006 for the best Ph.D. thesis.

A series of measurements of operating characteristics of lighting fittings and a large number of electric energy quality measurements were carried out in cooperation with the industrial sector.

Major Research Projects

Development of Nuclear Education at Czech Universities - MŠMT 480
Co-investigator: Petr Toman

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

Selected Publications

COUFAL, O., ŽIVNÝ, O. Interval of Occurrence of a Component in Low-Temperature Plasma. Czechoslovak Journal of Physics, ISSN 0011-4626, 2006, vol. 56(2006), no. Suppl. B, pp. 1401 - 1 406.

GREGOR, J., JAKUBOVÁ, I., MENDL, T., ŠENK, J. Investigation of Hot Gas Mixture Free Jet. Journal of Advanced Oxidation Technologies, ISSN 1203-8407, Canada, 2006, vol. 9, no. 2, pp. 220 - 223.

LÁZNIČKOVÁ, I. Collision integrals in Transport Properties Calculation of Air. Czechoslovak Journal of Physics, ISSN 0011-4626, 2006,vol. 56(2006), no. Suppl. B, pp. 890 - 895.

SKALA, P., DĚTŘICH, V., BLAŽEK, V., MATONOHA, K., ŠPAČEK, Z., GÖHLER, M. Modeling of Supply Interruption in MV Cable Distribution Networks for a More Accurate Estimation of the Cost of Penalty Payments. IEEE Transactions on Power Systems, ISSN 0885-8950, 2006, vol. 2006, no. 2, pp. 605 - 610. VOL. 21, NO. 2

BLAŽEK, V., SKALA, P. Optimization of design and operation of an urban power distribution network operated in conditions of liberalized energy market. Technična elektrodynamika, ISSN 0204-3599, 2006, vol. 2006, no. 2, pp. 30 - 35. Nacionalnaja akademija nauk Ukrajiny.

DRÁPELA, J., MASTNÝ, P., PROCHÁZKA, Z. Light flicker caused by interharmonics and interharmonic-flicker curves of lamps. WSEAS Transactions on Power Systems, ISSN 1790-5060, 2006, vol. 1, no. 2, pp. 554 - 561.

DRÁPELA, J., TOMAN, P., ORSÁGOVÁ, J., KRÁTKÝ, M. Simulation of Instrument Voltage Transformers Properties in Power Systems. WSEAS Transactions on Power Systems, ISSN 1790-5060, 2006,vol. 2, no. 1, pp. 536 - 543.

Bachelor's Programme

Computer Modelling and Simulations (Petr Baxant)

Design in power electric systems (Petr Toman)

Distribution Equipment (Jaroslava Orságová)

Economy and Control (Michal Chmela)

Electrical Power Distribution (Vladimír Blažek)

Electrical Power Generation (Antonín Matoušek)

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's Programme

Diagnostics in electricity industry (Jiří Drápela)

Economy of Electrical Power Engineering (Michal Chmela)

Electrical heat technology (Petr Baxant)

Fittings of Light. (Petr Baxant)

Flexible AC Transmission Systems (Petr Toman)

Information and Control Systems in Power Engineering (Petr Baxant)

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 Engineering in Environment (Antonín Matoušek)

Power Plant Automation. (Michal Chmela)

Power Plants and Heating Power Stations (Antonín Matoušek)

Power Systems (Michal Chmela)

Power Systems Control (Evžen Haluzík)

Power transmission networks (Vladimír Blažek)

Some chosen issues of power engineering (Vladimír Blažek)

Substations and Lines (Jaroslava Orságová)

The power quality and EMC 1 (Jiří Drápela)

Town and Industry Networks. (Jaroslava Orságová)

Transient Phenomena (Michal Chmela)

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 network, 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)

Lighting Technology Laboratory (instruction in Lighting Technology, Lighting Systems, testing of light sources and systems, 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)

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

Computer Laboratory (2) (instruction in Computers and Programming 1 and 2, planning in power engineering, steady and transient states in electrification systems, Petr Baxant, Petr Mastný)

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Doc. RNDr. Miroslav Cenek, CSc.
Doc. Ing. Karel Liedermann, CSc.
Doc. Ing. Josef Jirák, CSc.
Doc. Ing. Marie Sedlaříková, CSc.

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Administrative and Technical Staff

Jarmila Bartošková, Ing. Zdeněk Buřival, CSc., Ing. Petr Kahle, František Kořínek, Rudolf Krásenský, Ing. Radek Kubásek, Ph.D., Ing. Jiří Macola, Ing. Vítězslav Novák, Ph.D., Dagmar Prosová, Ing. Jiří Starý, Ph.D., Ing. Miloslav Steinbauer, Ph.D., Ing. Miroslav Zatloukal Martin Zatloukal

Main Interests

In 2006, the department provided tuition in the subject Materials and Technical Documentation in the first year of the Bachelor degree programme EECR as well as tuition of 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 in both the Bachelor and Master study programmes.

Research was centred on basic and applied research of electrochemical sources of electric energy – lead-acid batteries, alcaline batteries and fuel cells, renewable sources of electric energy in general and their exploitation in alternative transport by electric and hybrid vehicles, detection of signal electrons and methods of environmental scanning electron microscopy, gel electrolytes and their utilization in lithium-ion batteries, electrocatalysts for fuel cells and thin-layer 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 national and international institutions: Technische Universität Wien, Universität Ulm, École Polytechnique de Montréal, Institute of Instrument Technology, Institute of Anorganic Chemistry, and Institute of Physical Chemistry of Czech Academy of Sciences, with the companies Bochemie Bohumín, CINK vodní elektrárny Karlovy Vary, ČAS-Service Znojmo, EPRONA a.s. Rokytnice n. Jizerou, ROTOKOV Křídlůvky u Znojma.

Research will continue in 2007 in all mentioned study areas as related to the GACR, GAAV, FRVS research projects and within the framework of the research plan ´Resources, Accumulation and Optimization of Electric Energy Exploitation in Conditions of Permanently Sustainable Growth´.

Upgrading of laboratories for instruction and research will continue. Computer rooms and the library are increasingly used for self-study and preparation of new subjects in both the Bachelor and Master study programmes. New subjects will be offered in the part-time format of study, also in the follow-up Master programme.

Major Achievements

In 2006, the department hosted the ´7th International Conference Advanced Batteries and Accumulators´ (A. B. A. - 7) Brno (Marie Sedlaříková, Professor Vondrák). The department co-organized the 27th conference ´Non-Conventional Sources of Electric Energy´ together with the Czech Electrotechnical Society, group for chemical sources of electric energy (Milan Calábek).

Representatives of the department participated in the regular meeting of institutes and departments of electrotechnology of Czech and Slovak technical universities ´Elektrotechnologie 06´, organized as an international conference by the Department of Technology and Measurement of the Faculty of Electrical Engineering, Plzeň (Professor Kazelle).

On the occasion of the visit in October 2006 of Professor Günter Fafilek (Institut für Chemische Technologie und Analysis, Technische Universität Wien) the department organized a seminar on impedance spectroscopy (Marie Sedlaříková, Professor Vondrák).

Two representatives of the company Bekaert NV, Bekaert Technology Centre Zwevegen, Belgium Dr. Nadine van de Velde (head of research) a Dr. Anneke Segers visited our department. We discussed cooperation in research of gel polymer electrolytes for electrochromic components, and the guests offered placements for Ph.D. students (Marie Sedlaříková, CSc., Professor Vondrák).

The department was the chief investigator or co-investigator of one GAAV project (Development of a composite structure of electrode materials deposited on ion-exchanger membranes), three GACR projects, one project of the Ministry of the Environment and three FRVS projects. Under the leadership of Professor Kazelle, in cooperation with the departments of Power Electrical and Electronic Engineering, Power Electrical Engineering and Theoretical and Experimental Power Engineering the research plan ´Resources, Ac-

cumulation and Optimization of Electric Energy Exploitation in Conditions of Permanently Sustainable Growth´ continued. The members of the start participated in another research plan at the faculty.

Major Research Projects

New Methods of Non-Destructive Quality Testing of Contacts in Photovoltaic Cells – GAČR 102/05/P199
Investigator: Jiří Vaněk

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

Systems of Electric Energy Accumulation from Renewable Sources – VaVSN/3/171/05
Investigator: Marie Sedlaříková

Systems of Secondary Electrons Detection in Newly Conceived Environmental Scanning Electron Microscope – GAČR 102/05/0886
Investigator: Josef Jirák

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

Selected Publications

SEDLAŘÍKOVÁ, M., VONDRÁK, J. Selected Papers from the Sixth International Meeting on Electrochromism. Solar Energy Materials and Solar Cells, ISSN 0927-0248, 2006, pp. 383 - 384.

KŘIVÁK, P., BAČA, P., MICKA, K., CALÁBEK, M. Significance of carbon additive in negative lead-acid battery electrodes. Journal of Power Sources, ISSN 0378-7753, 2006, vol. 158, no. 2006, pp. 864 - 867.

KŘIVÁK, P., BAČA, P., CALÁBEK, M., MICKA, K., KRÁL, P. Current distribution over the electrode surface in a cylindrical VRLA cell during discharge. Journal of Power Sources, ISSN 0378-7753, 2006, vol. 154, no. 2006, pp. 518 - 522.

REITER, J., VONDRÁK, J. Ternary polymer electrolytes with 1-methylimidazole based ionic liquids and aprotic solvents. Electrochimica Acta, ISSN 0013-4686, 2006, vol. 52, no. 3,pp. 1398 - 1 408.

REITER, J., VONDRÁK, J. Poly(ethyl methacrylate) and poly(2-ethoxyethyl methacrylate) based polymer gel electrolytes. Journal of Power Sources, ISSN 0378-7753, 2006, vol. 158, no. 1, pp. 509 - 517.

SEDLAŘÍKOVÁ, M., VONDRÁK, J. Kinetics of sodium borohydride direct oxidationand oxygen reduction reaction in sodium hydroxide electrolyte - Part II. O-2 reduction. Electrochimica Acta, ISSN 0013-4686, 2006, vol. 51, no. 25, pp. 5452 - 5 458.

VONDRÁK, J., SEDLAŘÍKOVÁ, M., VLČEK, M., MOHELNÍKOVÁ, J., MACALÍK, M. Electrochromic Glazings For Window Applications. Solid State Phenomena, ISSN 1012-0394, 2006, vol. 113, no. 5, pp. 507 - 512.

Bachelor's 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's Programme

3D modeling (Jiří Maxa)

Alternative energy sources (Jiří Vaněk)

CAD 1 (Pavel Procházka)

CAD 2 (Jiří Maxa)

CADDS5 advanced model (Jiří Maxa)

CADDS5 basic 3D modell (Jiří Maxa)

CADDS5 Manufacture (Jiří Maxa)

Climatotechnology in Electrical Engineering (Helena Polsterová)

Climatotechnology in Electrical Engineering (Karel Liedermann)

Computer Aided Scheme Systems (Vítězslav Novák)

Computers system for projects (Vítězslav Novák)

Control and data administration (Jiří Maxa)

Design of Production Systems and Logistic (Jiří Špinka)

Design View (Jiří Maxa)

Diagnostic Methods in Electroengineering (Josef Jirák)

Diagnostics and Testing in Electrical Engineering (Josef Jirák)

Ecology in Manufacturing (Miroslav Cenek)

Electroinsulation systems (Helena Polsterová)

Fundamentals of Reliability in Electrical Engineering (Helena Polsterová)

Graphic Systems 2 (Pavel Procházka)

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

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)

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 and diploma theses in 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 Electrotechnical Materials I (instruction in Materials and Technical Documentation, Petr Křivák)

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, Zdenka Rozsívalová)

Chemical Laboratories (2) (research for Bachelor, diploma and doctoral theses focused on fuel cells, lithium-ion batteries and supercapacitors, Marie Sedlaříková)

Laboratory of Chemical Sources of Electric Energy (research of lead-acid accumulators, Milan Calábek)

Chromatographic Laboratory (research, instruction, Bachelor and diploma theses focused on application of gas chromatography in technical practice, Marie Sedlaříková)

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 for Research of Accumulator Batteries for Electric Vehicles (long-term tests of Ni-Cd accumulator batteries, alternative transport, Miroslav Cenek)

Laboratory for Research of Photovoltaic Cell-Accumulator Battery Systems (Jiří Vaněk)

Computer Laboratory (2) (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, Helena Polsterová)

Department of Physics

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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. RNDr. Marian Štrunc, CSc.

Lecturers

Ing. Jitka Brüstlová, CSc., RNDr. Pavel Dobis, CSc., RNDr. Eva Hradilová, Mgr. Jan Pavelka, CSc., Ing. Vlasta Sedláková, Ph.D., RNDr. Naděžda Uhdeová, Ph.D., RNDr. Oldřich Veverka, RNDr. Vladimír Zdražil, Ph.D.

Postgraduate Students

Mustafa M. Abdalla Ahmed, Ing. Alexey Andreev, Ing. Martin Bláha, Ing. Salem Omar Saeid El-Fakhri, Ing. Jan Havránek, Ing. Štěpán Hefner, Ing. Vladimír Holcman, Ing. Jaroslav Kala, Ing. Jiří Majzner, Mgr. Dana Otevřelová, Ing. Tomáš Palai-Dany, Ing. Jaromír Pelčák, Ing. Michal Raška, Ing. Petr Sedlák, Ph.D., Ing. Rostislav Stráník, Ing. Jiří Zajaček

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Lenka Horká, Miroslav Sadovský, Ing. Petr Sadovský, Ph.D., Ing. Alena Václavíková, Ing. Vít Vrba

Main Interests

In 2006, the department provided tuition in the basic courses of the Bachelor degree programme Physics 1, Physics 2 and Physics for Information Technology, and in subjects of the Master degree programme Nanotechnology, Modern Physics, Solid Phase Physics and Non-Destructive Diagnostics and Physics of Dielectrics. A new subject Interfaces and Nanostructures was introduced in the doctoral degree programme, and tuition continued in the subject Spectroscopic Methods for Non-Destructive Diagnostics.

The tasks for Physical Practice and multimedia study materials were updated for instruction in the computer room and for student self-study. Innovated and updated laboratory tasks were elaborated, and work on new instruction materials continued.

Research was centred on basic and applied research of the physical parameters of semiconductor and dielectric materials. The main areas of interest were noise spectroscopy, measurement of nonlinearities and design of quality and reliability indicators for non-destructive assessment of each technological stage in mass production. Very good results were achieved in research of the properties of sensors of acoustic and electromagnetic emission, local spectroscopy, topography, photoluminescence of semiconductor and photonic structures and dielectric relaxation spectroscopy of anorganic and organic materials. The department cooperated with European and Japanese laboratories in the field of noise spectroscopy and nanotechnology, extended cooperation with Augsburg University, Germany in research of dielectrics, and cooperated with the leading Czech laboratories in the development and enhancement of parameters of CdTe radiation detectors.

Added to the equipment of research laboratories were a number of up-to-date devices, and a workplace for experimental study of semiconductor and dielectric samples at low temperatures (up to 10 K) was established.

Major Achievements

In 2006, there were four GACR and four FRVS grant projects, a KONTAKT project and an INGO project at the department. We also completed an order for AVX. The GACR projects were focused on nonlinear defectoscopy of solids, irreversible processes in dielectrics, and processes with impact on energy transport in arc charge with liquid stabilization.

The international project KONTAKT, with chief investigator Professor Šikula, deals with research of noise in HEMT components for global communication. Cooperation was started with MEISEI University in Tokyo, University of Florida, and Gdansk University where our department can use unique technological apparatus for experiments.

Following participation in the INGO project, Professor Tománek was elected one of the six members of the Executive Board of European Optical Association – a reputable European scientific organization and a highly regarded partner of the European Commission in preparation of the 7th FP.

Two of the FRVS projects dealt with upgrading of laboratories for tuition in Bachelor subjects and for introduction of the subject Nanotechnology.

Laboratory of Optical Nanometrology was invited to join, as a third party, the European Network of Excellence – NEMO in micro and nanooptics for 2007-2008.

A majority of the department´s research staff were involved in the research plan MSM 0021630503 – MIKROSYN, with co-investigator Lubomír Grmela.

Research results were published in several impact journals and presented at international conferences.

Lecture notes Fyzikální praktikum (Physical Practice), Uhdeová et al. were issued for use in laboratory exercises.

Major Research Projects

Diagnostics of PN Components By Means of Microplasma Noise – GAČR 102/06/1551
Investigator: Pavel Koktavý

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

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

Sources of Noise in Semiconductor Materials and Components – GAČR 102/05/2095
Investigator: Josef Šikula

Selected Publications

AHMED, M., TOMÁNEK, P. Influence of charged centres on transport characteristics of alternating current thin film electroluminescent devices. Proceedings of SPIE, ISSN 0277-786X, 2006, vol. 6018, no. 6018, pp. 61 - 65.

BARTLOVÁ, M., AUBRECHT, V. Photoabsorption of diatomic molecules. Czechoslovak Journal of Physics, ISSN 0011-4626, 2006, vol. 56, no. Suppl. B, pp. B632 - 5.

GRMELA, L., KALA, J., TOMÁNEK, P. Local photoluminescence in InAs/GaAs heterostructures with quantum dots and artificial molecules. Proceedings of SPIE, ISSN 0277-786X, 2006, vol. 6180, no. 6180, pp. 517 - 522.

JENIŠTA, J., BARTLOVÁ, M., AUBRECHT, V. Performance of water and hybrid stabilized electric arcs: the impact of dependence of radiation losses and plasma density on pressure. Czechoslovak Journal of Physics, ISSN 0011-4626, 2006, vol. 56, no. Suppl. B, pp. B1224 - 6.

JENIŠTA, J., BARTLOVÁ, M., AUBRECHT, V. Properties of arc discharge with hybrid stabilization. High Temperature Material Processes: An International Journal, ISSN 1093-3611, 2006, vol. 10, no. 4, pp. 501 - 513.

MORI, Y., SEDLÁK, P., ŠIKULA, J. Estimation of Rock In-situ Stress by Acoustic and Electromagnetic Emission. Advanced Materials Research, ISSN 1022-6680, 2006, vol. 2, no. 13-14, pp. 357 - 362.

ŠIKULA, J., MAJZNER, J., SEDLÁK, P., MORI, Y. Electromagnetic and Acoustic Emission Fine Spectra. Advanced Materials Research, ISSN 1022-6680, 2006, vol. 2, no. 13-14, pp. 169 - 174.

CVRK, L., VRBA, V. A novel system of access control for server applications in web environments. International Transaction on Computer Science and Engineering, ISSN 1738-6438, 2006, vol. 2006, no. 35, pp. 186 - 198.

EL-FAKHRI, S., LIEDERMANN, K. Relaxation Effects In Dielectric Spectra of Hyaluronic Acid In 4th Conference of the International Dielectric Society & 9th International Conference on Dielectric & Related Phenomena IDS & DRP 2006. 2006, pp. 173 - 173,

HASSE, L., ŠIKULA, J., BLÁHA, M. Analysis of non-linear effects as a diagnostic tool. Zeszyty Naukove Wydzialu Elektroniki i Automatyki Polytechniki Gdanskiej, ISSN 1425-5766, 2006,vol. 22, no. 1, pp. 63 - 71.

STRÁNÍK, R., LIEDERMANN, K. Dielectric Relaxation In Glycerol At Long-Time Exposure To Low Temperatures. Zeszyty naukowe Politechnika Lodzka, ISSN 0458-1555, 2006, vol. 9, no. 49, pp. 302 - 303.

Bachelor's Programme

Physics 1 (Pavel Dobis)

Physics 2 (Milada Bartlová)

Seminar of Physics (Eva Hradilová)

Master's 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 properties of optoelectronic and photonic structures, Pavel Tománek)

Department of Languages

PhDr. Milena Krhutová, Ph.D.
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Lecturers

Mgr. Marie Bartošová, Mgr. Ladislav Baumgartner, PaedDr. Alena Baumgartnerová, Mgr. Petra Boková, PhDr. Marcela Borecká, Mgr. Přemysl Dohnal, M. A. Kenneth Froehling, Ing. Martin Jílek, PhDr. Milena Krhutová, Ph.D., Mgr. Petra Langerová, PhDr. Dagmar Malíková, Mgr. Jana Malíková, PhDr. Ludmila Neuwirthová, Ph.D., Ing. Helena Pálková, PAED IGIP, Mgr. Věra Pražáková, Mgr. Šárka Rujbrová, Mgr. Veronika Svobodová, Mgr. Jaroslav Trávníček

Administrative and Technical Staff

Lea Domanská, Miroslava Purová, Hana Vondráčková

Main Interests

In 2006, the department continued to extend the offer of courses, particularly in the Bachelor degree programme. Within the framework of the development project ´Development of the System of Language Teaching, with focus on English the department introduced new specialized courses targeted at preparing the students for placements and work in European Union countries. Electronic support for all courses was produced and made accessible to full-time and part-time Bachelor students for self-study. The department purchased new multimedia devices for instruction. Textbooks, instruction CDs and scientific publications were purchased for both the teachers and the students. Instruction is centred on standardization of language courses and output language skills with the referential levels set by the European Reference Framework given by the European Commission, that is on increasing students´ output language skills, mainly English. Courses dealing with pedagogical and economic issues - management skills, ethics, business, significantly increasing the qualifications of graduates, were innovated.

Research focused on analysis of discourse in the language of electrical engineering and didactics of teaching English and German at a technical university. Based on research results (a Ph.D. thesis) output standards for language skills in English were defined. Research results and teaching experience were presented at international and national conferences and published. The staff members cooperated with other faculty departments in research plans, Leonardo da Vinci projects and development projects. The department cooperated with the Centre of Languages of Masaryk University Brno in preparation of a joint project. One lecturer was a visiting professor at the University of Bucuresti, another lecturer defended her PhD. thesis.

Innovation of language courses will continue. As numbers of taught students are increasing (Faculty of Electrical Engineering, Faculty of Information Technology, Faculty of Business and Management), a new teacher of English joined the staff. Additions to offered courses are anticipated in the pedagogical-psychological section (System of Taxation, Cognitive Psychology)

Major Achievements

Krhutová, M. The Appropriate English for Engineering Qualifications. 9th International Conference on Engineering Education ICEE-2006, San Juan, Puerto Rico, USA, ISBN 1-58874-648-8.

Neuwirthová, L. Academic Foreign Language Standard in Electrical Engineering. Int conference Languages for Specific Purposes in Higher Education: Searching for Common Solutions, FSI VUT Brno, pp. 160-169, ISBN 80-214-3213-6.

Borecká, M. Success at Teaching English and Spanish for General and Specific Purposes to Engineering Students. 9th International Conference on Engineering Education ICEE-2006, San Juan, Puerto Rico, USA, ISBN 1-58874-648-8.

Malíková, D. Development of Professional Writing Skills in English in Engineering Education. 35th International IGIP Symposium, Tallinn, Estonia, ISBN 9985-59-646-3.

Pálková, H. Issues of Social Skills of Teachers-Engineers. 35th International IGIP Symposium, Tallinn, Estonia, ISBN 9985-59-646-3.

Malíková, J. Adopting an E-learning Strategy as a Tool for Successful Language Learning. 35th International IGIP Symposium, Tallinn, Estonia, ISBN 9985-59-646-3.

Baumgartner, L. Fremdsprachenausbildung für Ingenieure (Am Beispiel der Deutschen Sprache). 35th International IGIP Symposium, Tallinn, Estonia, ISBN 9985-59-646-3.

Froehling, K. Impressions of Canada by German Internees and Canadian Impressions of Them During the Second World War. 4th International Conference of the Central European Association for Canadian Studies, Debrecen, Hungary.

Langerová, P. Raising efficiency in teaching mathematics in non-English speaking countries: an electronic bilingual dictionary of mathematical terminology. 3rd International Conference on Teaching Mathematics at the Undergraduate Level, Istanbul, Turkey, ISBN 0471072709.

Neuwirthová, L. Leonardo da Vinci CZ/06/B/F/PP-168022 E-Learning Distance Interactive Practical Education, language support

Neuwirthová, L. Completion of the doctoral study in Pedagogy at Masaryk University Brno. Doctoral thesis Standardization of Language Education at Technical Higher Education Institutions.

Bachelor's Programme

Bookkeeping for managers (Martin Jílek)

Business English (Dagmar Malíková)

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

Double-Entry Bookkeeping (Martin Jílek)

Engineering Pedagogy and Didactics (Helena Pálková)

English for bachelors 2 (Jaroslav Trávníček)

English for bachelors- intermediate 1 (Petra Langerová)

English for bachelors- pre-intermediate 1 (Šárka Rujbrová)

English for bachelors- pre-intermediate 2 (Marie Bartošová)

English for Europe (Přemysl Dohnal)

German for Beginners (Ladislav Baumgartner)

German for Intermediate Students I. (Ladislav Baumgartner)

German for Lower-Intermediate (Ladislav Baumgartner)

Laboratory didactic (Helena Pálková)

Pedagogical Psychology (Věra Pražáková)

Present philosophy - postmodernism (Milan Klapetek)

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

Professional Success (Martin Jílek)

Reading Skills (Marcela Borecká)

Russian for Beginners (Alena Baumgartnerová)

Russian Pre-Intermediate (Alena Baumgartnerová)

Spanish for Beginners (Marcela Borecká)

Spanish for Lower-Intermediate Students (Marcela Borecká)

Master's Programme

Bookkeeping for managers (Martin Jílek)

Business English (Dagmar Malíková)

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

Double-Entry Bookkeeping (Martin Jílek)

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)

New Headway Intermediate (Přemysl Dohnal)

Present philosophy - postmodernism (Milan Klapetek)

Professional English for Electr. Engineering and Comp. Science. (Ludmila Neuwirthová)

Professional Success (Martin Jílek)

Reading Skills (Marcela Borecká)

Russian for Beginners (Alena Baumgartnerová)

Russian Pre-Intermediate (Alena Baumgartnerová)

Spanish for Beginners (Marcela Borecká)

Spanish for Lower-Intermediate Students (Marcela Borecká)

Doctoral Programme

English for post-graduates (Dagmar Malíková)

English for the state doctoral exam (Milena Krhutová)

Department of Mathematics

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

Associate Professors

Doc. RNDr. Jaromír Baštinec, CSc.
Doc. RNDr. Jaroslav Bayer, CSc.
Doc. RNDr. Martin Kovár, Ph.D.
Doc. RNDr. Josef Zapletal, CSc.

Lecturers

RNDr. Lubomir Bajgar, Mgr. Helena Durnová, Ph.D., RNDr. Mgr. Břetislav Fajmon, Ph.D., RNDr. Petr Fuchs, Ph.D., Mgr. Irena Hlavičková, RNDr. Dana Hliněná, Ph.D., RNDr. Edita Kolářová, Ph.D., RNDr. Vlasta Krupková, CSc., Mgr. Michal Novák, Ph.D., RNDr. Zdeněk Svoboda, CSc., RNDr. Svatopluk Švarc, CSc., Mgr. Marie Tomšová

Postgraduate Students

Ing. Jaroslav Klimek

Administrative and Technical Staff

Marie Krejčířová

Main Interests

In 2006, the department was responsible for tuition in full-time and part-time Bachelor degree programme, the newly-introduced Master degree programme, two postgraduate courses and a number of courses for the Faculty of Information Technology.

Research was focused on mathematical models of processes described by differential, integrodifferential and difference equations with strong nonlinearities and errors, including functional equations with delayed argument. Attention was centred on the qualitative behaviour of operator dynamic systems. Sufficient conditions were defined for the existence of steady periodic outputs in case of singular errors represented by compact operators, and input and output points were modified in the so called asymptotic tunnel. In case of an asymptotic behaviour of continuous systems described by differential equations the Lyapunov functions were efficiently applied. In studies of the solution characteristics of linear discrete systems with delayed argument (or feedback), which are a suitable tool for description of nanotechnological phenomena with finite memory, a new way of expressing the solution of initial problems by introducing so called delayed matrix exponentials (this research was carried out in cooperation with Professor Khusainov from Kiiv State University). Hypergroups of partial linear differential 1st order operators were studied as well as certain significant subhypergroups, embedding of semihypergroups of Volterr integral operators with differential cores into a transform hypergroup of certain transforms of a half plane of complex numbers. The constructed embedding was created by means of the conventional Laplace transform.

Roger Williams University, Rhode Island, USA, Matematisches Institut Universität Stuttgart and technical universities in Klagenfurt, Dresden, Kiiv, Udine and Žilina.

Major Achievements

The department was granted 6 FRVS projects, 1 GACR and I GAAV project.

Professor Diblík, Professor Chvalina and Professor Neuman were involved in organization of the 5th International Mathematical Workshop, Faculty of Civil Engineering, Brno University of Technology, Jaromír Baštinec and Professor Chvalina co-organized the international conference ´XXII. International Colloqium on the Acquisition Process Management´, University of Defence, Brno.

The department's staff published several original

papers in reputable scientific journals:

DIBLÍK, J., KHUSAINOV, D.: Representation of solutions of discrete delayed system x(k+1)=Ax(k)+Bx(k-m)+f(k). Journal of Mathematical Analysis and Application, ISSN 0022-247X, 2006, vol. 2006, no. 318, pp. 63 - 76.

DIBLÍK, J., MIGDA, M., SCHMEIDEL, E.: Bounded solutions of nonlinear discrete equations. Nonlinear Analysis, Theory, Methods and Applications, ISSN 0362-546X, 2006, vol. 65 (2006), no. , pp. 845 - 853.

DIBLÍK, J., SVOBODA, Z. : Positive solutions of p-type retarded functional differential equations. Nonlinear Analysis, Theory, Methods and Applications, ISSN 0362-546X, 2006, vol. 64 (2006), no. 1, pp. 1831 - 1 848.

DIBLÍK, J., KOKSCH, N.: Sufficient conditions for the existence of global solutions of delayed differential equations. Journal of Mathematical Analysis and Application, ISSN 0022-247X, 2006, vol. 318 (2006), no. , pp. 611 - 625.

ŠMARDA, Z.: Existence and Uniqueness of Solutions of Nonlinear Integrodifferential Equations. Journal of Applied Mathematics, Statistics and Informatics., ISSN 1336-9180, 2006, vol. 1, no. 2, pp. 73 - 77.

ŠMARDA, Z.: On singular initial value problem for nonlinear Fredholm integrodifferential equations. Fasciculi Mathematici, ISSN 0044-4413, 2006,vol. 1, no. 37, pp. 77 - 83.

Major Research Projects

Differential Equations and Dynamic Equations on "Time Scales" – GAČR 201/04/0580
Investigator: Josef Diblík

Limiting Characteristics of Solutions of Differential Equations– GAAV IAA1163401
Investigator: Josef Diblík

Selected Publications

DURNOVÁ, H. Mathematik im Wandel. Kapitola: Otakar Boruvka (1899-1995) and the Minimum Spanning Tree. 1 vyd. Hildesheim, Berlin: Franzbecker, 2006. pp. 264 - 274 . ISBN 3-88120-427-x

DIBLÍK, J., SVOBODA, Z. Positive solutions of p-type retarded functional differential equations. Nonlinear Analysis, Theory, Methods and Applications, ISSN 0362-546X, 2006, vol. 64 (2006), no. 1, pp. 1831 - 1 848.

DIBLÍK, J., KOKSCH, N. Sufficient conditions for the existence of global solutions of delayed differential equations. Journal of Mathematical Analysis and Application, ISSN 0022-247X, 2006, vol. 318 (2006), no. 1, pp. 611 - 625.

DIBLÍK, J., KOKSCH, N. Existence of global solutions of delayed differential equations via retract approach. Nonlinear Analysis, Theory, Methods and Applications, ISSN 0362-546X, 2006, vol. 64 (2006), no. 1, pp. 1153 - 1 170.

DIBLÍK, J., KHUSAINOV, D. Representation of solutions of discrete delayed system x(k+1)=Ax(k)+Bx(k-m)+f(k). Journal of Mathematical Analysis and Application, ISSN 0022-247X, 2006, vol. 2006, no. 318, pp. 63 - 76.

DIBLÍK, J., MIGDA, M., SCHMEIDEL, E. Bounded solutions of nonlinear discrete equations. Nonlinear Analysis, Theory, Methods and Applications, ISSN 0362-546X, 2006, vol. 65 (2006), no. 1, pp. 845 - 853.

DIBLÍK, J., NOWAK, C. A nonuniqueness criterion for a singular system of two ordinary differential equations. Nonlinear Analysis, Theory, Methods and Applications, ISSN 0362-546X, 2006, vol. 64 (2006), no. 1, pp. 637 - 656.

CHVALINA, J., HOŠKOVÁ, Š. Transposition hypergroups associated to linear partial differential operators. Journal of Basic Science, ISSN 1735-0611, 2006, vol. 3(2006), no. 1, pp. 19 - 26.

KOVÁR, M. The compactificability of certain spaces. International Journal of Mathematics and Mathematical Sciences, ISSN 0161-1712, 2006, vol. 2006, no. Article ID 67083, pp. 1 - 17.

KOVÁR, M. The compactificability classes: The behavior at infinity. International Journal of Mathematics and Mathematical Sciences, ISSN 0161-1712, 2006, vol. 2006, no. Article ID 24370, pp. 1 - 12.

NEUMAN, F. The role of the second order equations in higher order linear differential equations. Technical News, 2006, vol. 2006, no. 1(22),2(23), pp. 98 - 101.

ŠMARDA, Z. On singular initial value problem for nonlinear Fredholm integrodifferential equations. Fasciculi Mathematici, ISSN 0044-4413, 2006, vol. 1,no. 37, pp. 77 - 83.

ŠMARDA, Z. Existence and Uniqueness of Solutions of Nonlinear Integrodifferential Equations. Journal of Applied Mathematics, Statistics and Informatics., ISSN 1336-9180, 2006, vol. 1, no. 2, pp. 73 - 77.

Bachelor's Programme

Mathematical Seminar (Petr Fuchs)

Mathematics 1 (Vlasta Krupková)

Mathematics 2 (Jan Chvalina)

Mathematics 3 (Břetislav Fajmon)

Selected parts from mathematics (Zdeněk Šmarda)

Master's 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)

Department of Microelectronics

Prof. Ing. Vladislav Musil, CSc.

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Prof. Ing. Radimír Vrba, CSc.

Associate Professors

Doc. Ing. Arnošt Bajer, CSc.
Doc. Ing. Jaroslav Boušek, CSc.
Doc. Ing. Pavel Legát, CSc.
Doc. Ing. František Urban, CSc.

Lecturers

Ing. Martin Adámek, Ph.D., Ing. Lukáš Fujcik, Ph.D., Ing. Jiří Háze, Ph.D., Ing. Edita Hejátková, RNDr. Michal Horák, CSc., Ing. Jaromír Hubálek, Ph.D., Ing. Radek Kuchta, Ph.D., Ing. Radovan Novotný, Ph.D., Ing. Jan Prášek, Ing. Roman Prokop, Ing. Milan Recman, CSc., Ing. Ondřej Sajdl, Ph.D., Ing. Josef Šandera, Ph.D.

Postgraduate Students

Ing. Tomáš Brich, Ing. Pavel Cejtchaml, Ing. Issa El Dbib, Ing. Richard Ficek, Ing. Tomáš Fořt, Ing. Tomáš Havlíček, Ph.D., Ing. Ondřej Hégr, Ing. Radek Helán, Ing. Jiří Hladík, Ing. Luboš Jakubka, Ing. Jaroslav Kadlec, Ph.D., Ing. Anar Mammadov, Ing. Vít Matoušek, Ph.D., Ing. Filip Mika, Ing. Břetislav Mikel, Ing. Feras Moualla, Ing. Kamil Nováček, Ing. Marek Novotný, Ing. Vít Ondruch, Ing. Michal Pavlík, Ing. Jiří Stehlík, Ing. Pavel Šteffan, Ph.D., Ing. Jaroslav Týnek, Ing. Cyril Vaško

Administrative and Technical Staff

Ing. Daniel Bečvář, Ph.D., Ing. Jan Břínek, Iva Doušková, Jarmila Fučíková, Ing. Petr Hub, Petra Jedličková, Hana Jelínková, PhDr. Jarmila Jurášová, Ing. et Ing. Ahmad Khateb, Ph.D., Ing. Kateřina Klosová, Ing. Zdeněk Kozáček, Ing. Martin Magát, David Nejezchleb, Bc. Petr Novák, Vladislav Pliska, Ing. Marek Šimčák, Ph.D., Ing. Jan Vaněk

Main Interests

In 2006, the department provided instruction in basic subjects, mainly electronic components and circuits, and subjects specialized in the design of integrated circuits and microelectronic technology in both the new and the ending system of the Bachelor and Master degree programmes.

Research was centred on basic and applied research of integrated circuits and microelectronic mount technology. The main areas of interest were the design of switching current circuits and evaluation of signals from chemosensors and biosensors, mainly gases and pesticides, nanostructures (nanotubes, nanocolumns) in modified microelectrodes and advanced nanotechnology, optimization of implementation processes by nonvacuum technology (thick layers and surface mounting), simulation and evaluation of the reliability of 3D linking systems and cases. A unique sintering four-zone burning furnace BTU for preparation of thick-layer sensors was purchased, a laser cutting apparatus AUREL Protomat and a unique diagnostic apparatus Ersascope.

The department had close mobility cooperation with Bournemouth University in Great Britain and with KHBO Ostende, Belgium. There was research cooperation with BVT Technologies, Brno Pbt Rožnov p.R., Solartec, Autoflug Hamburg, Catalanian University Rovira i Virgili, Tarragona and the research laboratory IMEC-KHBO in Belgium.

In 2007, the department will be engaged in the design of integrated current mode circuits and a European Union grant project on smart aircraft fuel systems (UMEL will be involved in modelling of nonlinear dynamic phenomena in fuel systems and design of ASIC circuits for control circuits). The department will focus on evaluation of the reliability of lead-free soldering and linking of solar cells. Research of microsystems will focus on nanotechnology in modification of microsystems in sensing of mechanical and chemical properties. The department won a European social fund project on further education of secondary school teachers in the latest trends in electronics.

Increased attention is paid to student placements abroad.

Major Achievements

The members of the staff were involved in two projects of the 5th FP EU, in 5 GAČR projects, 2 projects of Academy of Sciences, 16 FRVŠ projects and 5 projects of the Ministry of Trade and Industry, and 2 projects of the Ministry of the Environment.

In September 2006 the department organized an international conference ´Electronic Devices and Systems EDS2006´ where 94 papers on microelectronics and microelectronic technology were presented.

The group involved in technology, headed by Ivan Szendiuch, achieved significant results in research of the characteristics and applications of lead-free soldering and modelling of the thermal stress in solder joints and cases. New findings were obtained in optimization of solar cells, mainly applications of thick layers. Designed and implemented was a testing chip for investigation of the reliability of joints at current values below 10 A.

The group of electrochemical sensors led by Jaromír Hubálek tested a new unique system for electrochemical analysis, and published their research results in the impact journal Sensors. Junior members of the research team won the first prize at the Junior conference on nanotechnology in Vienna and the prize Siemens for an outstanding diploma thesis.

The group headed by Jaroslav Boušek worked out novel ways of using various wavelengths of light for measurement of photovoltaic cells by the LBIC (Light Beam Induced Current) method. The response of the cell can be measured in the wavelength range 900 nm - 400 nm. It is, therefore, possible to study not only the volume, but also surface processes. In our workplace for dynamic diagnostics of cells by means of transient processes we can, with a relatively high accuracy, determine the barrier and diffusion capacity of the transition, volume recombination,

serial resistance of the cells and cut-off characteristics up to 15 A.

A workplace for diagnostics of partial discharge in electronic apparatus was set up. Partial discharge can be observed in devices with an operating frequency up to 50 Hz and operating voltage amplitude up to 8 kV.

In research of integrated circuits (IO), a bandpass sigma-delta modulator for sensing applications was designed and implemented as well as a chip with four transistor structures of active elements CDTA a CTTA, a chip for testing the characteristics of IO bonding. Two specific applications were developed for the CDTA element in active filters and quadrature oscillators, and were published in impact journals AEU - International Journal of Electronics and Communications a IEE Circuits, Systems& Devices. Other major achievements are smart pressure sensors.

Major Research Projects

Digitally Controlled Analog Operating Blocks – GAČR 102/05/0934
Investigator: Vladislav Musil

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

A Smart Biosensoric System for Detection of Pesticides and Herbicides in the Environment – MPO FT-TA/089
Investigator: Radimír Vrba

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

Micro- and Nanostructures in Microelectronic Technology– GAČR GP102/04/P162
Investigator: Jaromír Hubálek

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

Low-Power Structures of Photovoltaic Cells and Elements in FV Systems– MŽP VaV-SN-172-05
Investigator: Ivan Szendiuch

New Principles of Low-Voltage and Low-Input AD Converters in Submicron Technologies – GAČR 102/05/0869
Investigator: Radimír Vrba

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

Current and Integrated Mode Circuits for Analog Signal Processing– GAČR 102/05/0277
Investigator: Dalibor Biolek

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

Development of Microelectronic Mounting Technology for 3D Circuits and Systems – GAČR 102/04/0590
Investigator: Ivan Szendiuch

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

Research of New Methods for Pressure Measurement with Galvanic Separation for Electromagnetic Interference and Explosive Industrial Environment – MPO FT-TA2/087
Investigator: Radimír Vrba

Research of New Technologies and Methods for Pressure Difference Measurement and Verification on an Operating Sample of Intelligent Ceramic Sensor with a New Principle of Measurement– MPO FT-TA/050
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

Selected Publications

BABULA, P., HUŠKA, D., HANUSTIAK, P., BALOUN, J., KŘÍŽKOVÁ, S., ADAM, V., HUBÁLEK, J., HAVEL, L., KIZEK, R. Flow Injection Analysis Coupled with Carbon Electrodes as the Tool for Analysis of Naphthoquinones with Respect to Their Content and Functions in Biological Samples. Sensors, ISSN 1424-8220, 2006, vol. 2006, no. 6, pp. 1466 - 1 482.

FIEDLER, P., KUČERA, P., BRADÁČ, Z., HYNČICA, O., KACZ, P., VRBA, R. Embedded Computer Systems: Architectures, Modeling, and Simulation:. Chapter: On Security of PAN Wireless Systems. Berlin/Heidelberg, SRN: Springer, 2006. pp. 178 - 185. ISBN 3-540-36410-2

KESKIN, A., BIOLEK, D. Current mode quadrature oscillator using current differencing transconductance amplifiers (CDTA). IEE Proceedings - Circuits, Devices and Systems, ISSN 1350-2409, 2006, vol. 153, no. 3, pp. 214 - 218.

KESKIN, A., BIOLEK, D., HANCIOGLU, E., BIOLKOVÁ, V. Current-mode KHN filter employing current differencing transconductance amplifiers. AEU - International Journal of Electronics and Communications, ISSN 1434-8411, 2006, vol. 60, no. 6, pp. 443 - 446.

PRÁŠEK, J., ADÁMEK, M., HUBÁLEK, J., ADAM, V., TRNKOVÁ, L., KÍZEK, R. New Hydrodynamic Electrochemical Arrangement for Cadmium Ions Detection Using Thick-Film Chemical Sensor Electrodes. Sensors 2006, 6, ISSN 1424-8220, 2006,vol. 2006, no. 11, pp. 1498 - 1 512.

BIOLEK, D., DOBEŠ, J., POSOLDA, P. An Efficient Steady-State Analysis of Microwave Circuits. International Journal of Microwave and Optical Technology (www.ijmot.com), ISSN 1553-0396, 2006, vol. 1, no. 2, pp. 284 - 289.

BIOLEK, D., BIOLKOVÁ, V., KOLKA, Z. PSPICE modelling of Buck Converter by means of GTFs. WSEAS Transactions on Electronics, ISSN 1109-9445, 2006, vol. 3, no. 2, pp. 93 - 96.

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HORÁK, M. Single Potential Barrier in High-Frequency Electromagnetic Field. WSEAS Transactions on Electronics, ISSN 1109-9445, 2006, vol. 2006, no. 4, pp. 241 - 244.

KHATEB, A., KORÁB, V., GAFAROV, T., SOZONOV, A. BOT in Russia.. Real Sector of Economics: Theory and Practice of Management, ISSN 1813-7954, 2006, vol. 2006, No. 1(9), pp. 185 - 188.

KHATEB, A., KORÁB, V. Syria opts for BOT. Real Sector of Economics: Theory and Practice of Management, ISSN 1813-7954, 2006, vol. 2006, no. No. 1(9), pp. 189 - 191.

KOLKA, Z., WILFERT, O., BIOLEK, D., BIOLKOVÁ, V. Availability Model of Free-Space Optical Data Link. International Journal of Microwawe and Optical Technology (www.ijmot.com), ISSN 1553-0396, 2006, Vol. 1, no. 2, pp. 612 - 616.

SZENDIUCH, I. Importance of Eco-design Implementation in Engineering Education In International Conference on Engineering Education. ICEE 2006. San Juan: Stipest Publishing LLC, 2006, pp. 112 - 112, ISBN 1-58874-648-8

SZENDIUCH, I., MUSIL, V. Research and Postgraduate Study in Microelectronics Technology In International Conference on Engineering Education. ICEE 2006. San Juan: iNEER, 2006, pp. 66 - 66, ISBN 1-58874-648-8

Bachelor's 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's 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)

Manufacturing of electronics devices (Ivan Szendiuch)

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)

Doctoral Programme

Microelectronic Systems (Vladislav Musil)

Microelectronic Technology (Jaromír Hubálek)

Laboratories

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

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

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

Laboratory of Microelectronic Technology (thick films, soldering surface mounting, lead-free soldering, casing, instruction in Microelectronics and Assembly Technology, Modern Technology of Electronic Circuits and Systems, student projects, Ivan Szendiuch)

Laboratory of Chemical Sensors (research laboratory, Jaromír Hubálek)

Laboratory of Microsensors and Vacuum Technology (instruction in MIcrosensors and Microelectromechanical Systems, Jaromír Hubálek, Vacuum Technology and Cryotechnology, Jaroslav Boušek and Josef Šandera)

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

Laboratory of Vacuum Technology and Development of Electronic Devices (research and development laboratory, Jaroslav Boušek, Josef Šandera, Jaromír Hubálek)

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

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Prof. Ing. Jiří Svačina, CSc.
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Doc. Dr. Ing. Zdeněk Kolka
Doc. Ing. Jaromír Kolouch, CSc.
Doc. Ing. Zdeněk Nováček, CSc.
Doc. Ing. Aleš Prokeš, Ph.D.
Doc. Ing. Milan Sigmund, CSc.
Doc. Ing. Otakar Wilfert, CSc.

Lecturers

Ing. Viera Biolková, Ing. Tomáš Frýza, Ph.D., Ing. Ivana Jakubová, Ing. Marta Krátká, Ing. Tomáš Kratochvíl, Ph.D., Ing. Roman Maršálek, Ph.D., Ing. Václav Michálek, CSc., Ing. Jiří Petržela, Ph.D., Ing. Jan Prokopec, Ph.D., Ing. Jiří Šebesta, Ph.D., Ing. Tomáš Urbanec

Postgraduate Students

Ing. Vladimír Axman, Ing. Marek Bobula, Ing. Lucie Dordová, Ing. Pavel Dýmal, Ing. Lukáš Džbánek, Ing. Jakub Džubera, Ing. Zbyněk Fedra, Ing. Filip Gleissner, Ing. Petr Goldman, Ing. Ondřej Hála, Ing. Martin Hampl, Ing. Ivo Hertl, Ph.D,, Ing. David Hlaváč, Ing. Jiří Horák, Ing. Pavel Hovořák, Ing. Rostislav Hučka, Ing. Petr Chmela, Ing. Pavel Chytil, Ing. Ladislav Józsa, Ing. Tomáš Kašparec, Ing. Radim Kopp, Ing. Michal Kováč, Ing. Martin Kravka, Ing. Vítězslav Krčmář, Ing. Petr Křivák, Ing. Michal Kubíček, Ing. Petr Kučera, Andy A. Kuiper, Ph.D., Ing. Petr Kutín, Ph.D., Ing. Radek Kvíčala, Ing. Pavel Matějka, Ing. Zdeněk Mikéska, Ing. Jan Mikulka, Ing. Lukáš Oliva, Ing. Viktor Otevřel, Ing. Ondřej Pirochta, Ing. Petr Poměnka, Ph.D., Ing. Václav Pospíšil, Ing. Jaroslav Rumánek, Ing. Bohdan Růžička, Ing. Zdeněk Růžička, Ing. Zdeněk Řezníček, Ing. Martin Slanina, Ing. Martin Sloboda, Ing. Roman Sobek, Ing. Petr Stančík, Ing. Tomáš Sutorý, Ing. Václav Šádek, Ing. Jan Šebesta, Ing. Petr Šmíd, Ing. Jiří Špaček, Ing. Dalibor Štverka, Ing. Martin Švirák, Ph.D., Ing. Roman Tkadlec, Ph.D., Ing. Josef Urban, Ing. Petr Vágner, Ing. Michal Vavrda, Ing. Rostislav Vídenka, Ing. Ivo Viščor, Ph.D., Ing. Josef Vochyán, Ph.D., Ing. Michal Zamazal, Ph.D., Ing. Luděk Závodný

Administrative and Technical Staff

Květuška Bílá, Ing. Jiří Dřínovský, Ing. Martin Horák, Ph.D., Anna Kalná, Ing. Jaroslav Láčík, Ph.D., Ing. Vishwas Lakkundi, Ph.D., Ing. Zbyněk Lukeš, Ph.D., Dora Šebestová, Petra Šípová, Aleš Vanžura, Jaroslav Voráč

Main Interests

Research was centred on European projects. The department participated in the continuing integrated project ´Virtual Automation Networks (VAN)´. Moreover, the department succeeded in joining the COST project ´Antenna Systems & Sensors for Information Society Technologies (ASSIST)´ and the network of excellence Antenna Centre of Excellence (ACE). With reference to the above projects we have taken steps towards participation in the 7th FP EU.

Research is focused on modern electronic circuits, processing of signals and microwave circuits and antennas. Other areas of interest are mobile, satellite and optical communications, television, microprocessor and low-frequency electronics and electromagnetic compatibility. Funding for research comes from two research plans, two projects of the National Research Programme II, one research centre, 11 GACR projects, one junior GAAV project and one project of the Czech Ministry of Industry and Trade.

Research results are reflected in instruction in Bachelor, Master and Ph.D. study programmes. Upgrading of education was supported by 18 development FRVS projects and three doctoral GACR projects.

Besides the upgrading of subjects, increased effectiveness of instruction has been in the centre of attention. An audiovisual classroom for 90 students and a large computer room for 28 students were established. Contact lessons have been gradually substituted by self-study.

Top specialists from the industrial sector are invited to participate in education provided by the department. They read two lectures in the Ph.D. study programme, two lectures in the Master study programme, and offered nearly 30% of the topics for Master projects.

Major Achievements

Numerical modelling of meta-materials and their applications in antenna technology, new methods of analysis of special planar structures, measurement of atmospheric optical links, generalized sampling of bandpass signals and new current-mode filters. Research results were published in seven impact international journals of ISI, in one national monograph and 28 papers in international reviewed journals.

Our participation continued in the development and implementation of electronic communication systems for the international experimental satellite AMSAT Phase3E.

Cooperation has been maintained with T-Mobile CZ (measurement of the parameters of mobile networks), Andrew (modelling of special microwave filters), Evektor (electromagnetic compatibility of small planes), Škoda-Auto (antennas, transmission and reception systems), TheNet (wireless internet), AMI Semiconductor (analog integrated circuits and modelling), METRA Blansko (communication systems for locomotive tachometer), and other.

The department was involved in the founding and research programme of the Center for Quasioptical Systems and Terahertz Spectroscopy (a center of basic research) within the framework of a programme of the Ministry of Education (with the Czech Technical University and Institute of Chemical Technology, Prague).

On the occasion of the anniversary of Brno University of Technology, Mr. Otakar Wilfert, associate professor at the Department of Radioelectronics was awarded Silver Medal for research and education in optical and photonic communication.

A laboratory for creative activity of students was set up. Research and development results were presented within the framework of the National research programme 2. The start provided tuition in the University of the Third Age.

Major Research Projects

Algorithms for Increased Efficiency of Digital Predistorters in Basic Zone – GA AV ČR KJB208130601
Investigator: Roman Maršálek

Analytic Modelling of Special Microwave Planar Structures– GAČR 102/04/0553
Investigator: Jiří Svačina

Safe Optical Wireless Links for Municipal Networks - 2C06012
Investigator: Otakar Wilfert

Center of Quasioptical Systems and Terahertz Spectroscopy – ČR LC06071
Investigator: Zbyněk Raida

New Generation Electronic Communication Systems and Technologies (ELKOM) – ČR MSM0021630513
Investigator: Jiří Svačina

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

Implementation of a New Way of Communication for the System of Zonal Measurement - ST20052005014
Investigator: Jiří Šebesta

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: Zdeněk Kolka

Methods, Structures and Components of Electronic Wireless Communication – GAČR 102/03/H109
Investigator: Vladimír Šebesta

Methods Increasing the Reliability of Optical Directional Links – GAČR 102/05/0571
Investigator: Otakar Wilfert

Special Phenomena Modelling in Non-Linear Dynamic Structures – GAČR 102/04/0469
Investigator: Jiří Pospíšil

Mobile Network Modelling and Optimization – GAČR 102/04/2080
Investigator: Stanislav Hanus

Modern Methods of the Design and Application of Electronic Circuits – GAČR 102/03/H105
Investigator: Zdeněk Kolka

Novel Electronic Circuits with Modern Multiple-Gate Operating Blocks – GAČR 102/04/0442
Investigator: Tomáš Dostál

Novel Approach and Coordination of Doctoral Education in Radioelectronics and Related Disciplines– GAČR 102/03/H086
Investigator: Zbyněk Raida

Non-Conventional Methods of Modelling and Optimization of Microwave Structures – GAČR 102/04/1079
Investigator: Zbyněk Raida

Computer-Aided Modelling and Synthesis of Digital and Integrated Analog-Digital Systems – GAČR 102/05/0732
Investigator: Jaromír Kolouch

Advanced Methods of Computer-Aided Design of Circuits– GAČR 102/05/0771
Investigator: Zdeněk Kolka

Multiple Functions of Locomotive Recording Tachometer – MPO IM2/038
Investigator: Jiří Svačina

Design of Omnidirectional 1 - 10 GHz Aerial – ST20052005016
Investigator: Roman Tkadlec

Research of Interactive Systems Using Digital Terrestrial TV as an Information Channel for Czech Republic Citizens– AV185S020
Investigator: Václav Říčný

Research of Digital Radio Communication Systems – GAČR 102/04/0557
Investigator: Vladimír Šebesta

Selected Publications

GREGOR, J., JAKUBOVÁ, I., MENDL, T., ŠENK, J. Investigation of Hot Gas Mixture Free Jet. Journal of Advanced Oxidation Technologies, ISSN 1203-8407, Canada, 2006, vol. 9, no. 2, pp. 220 - 223.

HORÁK, J., CHMELA, P., OLIVA, L., RAIDA, Z. Multiband planar antennas on electromagnetic bandgap substrates: Complex global optimization of the structure. Microwave and Optical Technology Letters, ISSN 0895-2477, 2006, vol. 48, no. 12, pp. 2532 - 2 534.

KESKIN, A., BIOLEK, D., HANCIOGLU, E., BIOLKOVÁ, V. Current-mode KHN filter employing current differencing transconductance amplifiers. AEU - International Journal of Electronics and Communications, ISSN 1434-8411, 2006, vol. 60,no. 6, pp. 443 - 446.

PROKEŠ, A. Generalized Sampling Theorem for Bandpass Signals. EURASIP Journal of Applied Signal Processing, ISSN 1110-8657, 2006, vol. 2006, no. 12, pp. 1 - 6.

RAIDA, Z., LÁČÍK, J., HORÁK, J., OLIVA, L. Time-domain characterization of antennas in metamaterial media. Microwave and Optical Technology Letters, ISSN 0895-2477, 2006, vol. 48, no. 12, pp. 2530 - 2532.

SVAČINA, J. New Method for Analysis of Microstrip with Finite-Width Ground Plane. Microwave and Optical Technology Letters, ISSN 0895-2477, 2006, vol. 48, no. 2, pp. 396 - 399.

WILFERT, O., KOLKA, Z. Method for Measuring Target Cross Sections in Optical Band. Microwave and Optical Technology Letters, ISSN 0895-2477, 2006, vol. 48, no. 4, pp. 664 - 672.

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DOSTÁL, T. Second Order Filters Based on Single Transimpedance Amplifiers. WSEAS Transactions on Circuits, ISSN 1109-2734, 2006, vol. 2006, no. 7, pp. 1050 - 1 055.

GLEISSNER, F., HANUS, S. The BER Evaluation of UMTS under Static Propagation Conditions. WSEAS Transactions on Systems and Control, ISSN 1991-8763, 2006, vol. 5, no. 2, pp. 237 - 240.

KOLKA, Z., WILFERT, O., BIOLEK, D., BIOLKOVÁ, V. Availability Model of Free-Space Optical Data Link. International Journal of Microwawe and Optical Technology (www.ijmot.com), ISSN 1553-0396, 2006, Vol. 1, no. 2, pp. 612 - 616.

PETRŽELA, J., HANUS, S. Universal Structure of RC Oscillator and the Chaos Generation. WSEAS Transactions on Circuits, ISSN 1109-2734, 2006, vol. 6, no. 1, pp. 132 - 136.

SIGMUND, M. Spectral Characteristics of Vocal Tract for Speaker Recognition. International Journal of Computer Science and Network Security, ISSN 1738-7906, 2006, vol. 6, no. 1A, pp. 17 - 19.

ŠMÍD, P., RAIDA, Z. Application of neural networks: enhancing efficiency of microwave design. Microwave Review, ISSN 1453-5835, 2006, vol. 12, no. 1, pp. 2 - 10.

Bachelor's 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 (Tomáš Dostál)
Electronic Instruments Feeding (Jiří Šebesta)
Electromagnetic Compatibility (Jiří Svačina)
Electronic Practice (Marta Krátká)
EM Waves, Antennas and Lines (Zdeněk Nováček)
Fundamentals of TV Technology (Václav Říčný)
HF and Microwave Techniques (Jiří Svačina)
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 (Vladimír Šebesta)
Special Electronic Devices and their Applications (Jiří Svačina)

Master's Programme

Antennas and Radio Waves Propagation (Zdeněk Nováček)
Audiofrequency Electronics (Tomáš Kratochvíl)
CAD in HF and Microwave Techniques (Zbyněk Raida)
Community Antenna Television (CATV) (Václav Říčný)
Computer and Communication Networks (Zdeněk Kolka)
Computer Systems and their Applications (Zdeněk Kolka)
Digital television systems (Tomáš Kratochvíl)
Electromagnetic Compatibility (Jiří Svačina)
Electronic Circuits Theory (Tomáš Dostál)
Electronic Instruments Feeding (Jiří Šebesta)
Electronics in German (Milan Sigmund)
Microcomputers for Instrumental Applications (Václav Michálek)
Microwave Integrated Techniques (Jiří Svačina)
Mobile Communication Systems (Jan Prokopec)
Optoelectronics (Otakar Wilfert)
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 (Zdeněk Nováček)
Radio Receivers and Transmitters (Aleš Prokeš)
Radio Relay and Satellite Communication (Miroslav Kasal)
Speech Signal Analysis and Synthesis (Milan Sigmund)
Television Distribution Networks (Václav Říčný)
Television Technique (Václav Říčný)
Videotechnology (Václav Říčný)
Wireless and Mobile Communications (Stanislav Hanus)
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 Antennas and High-Frequency Technology (research and instruction in EM fields, antennas and design of radio links and hf technology, Zdeněk Nováček)

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

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

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

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

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

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

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

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 , Zdeněk Kolka)

Research and Development Laboratory of Digital TV and Video Technology (research of digital and compression methods of image signal processing, design of a device for digital video technology, Václav Říčný)

Research and Development Laboratory of Mobile Communications (point laboratory of the Department of Radioelectronics and T-Mobile CZ, research and development of mobile communication systems Stanislav Hanus)

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

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

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 Numerical Methods (research of the methods of analysis, design and optimization of microwave planar structures and antennas, Zbyněk Raida)

EMC pre-Compliance Test Laboratory (laboratory for pre-compliance measurement of interference emissions and electromagnetic resistance testing, Jiří Svačina)

Design Laboratory of Microprocessor Technology (design laboratory of microprocessor subsystems and systems, Václav Michálek)

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Doc. Ing. Karel Němec, CSc.
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. Petr Číka, Ing. Radim Číž, Ing. Otto Dostál, CSc., Ing. Ivo Herman, CSc., Ing. Ladislav Káňa, Ing. Dan Komosný, Ph.D., Mgr. Otakar Kříž, Ing. David Kubánek, Ph.D., Ing. Ivo Lattenberg, Ph.D., Ing. Jiří Mišurec, CSc., Ing. Karol Molnár, Ph.D., Mgr. Pavel Rajmic, Ph.D., Ing. Jiří Schimmel, Ing. Petr Sysel, Ing. Pavel Šilhavý, Ph.D.

Postgraduate Students

Ing. Mansour Mohamed Abaid, Ing. Petr Berka, Ing. Kamil Bodeček, Ing. Milan Březina, Ing. Lubomír Cvrk, Ing. Jan Čermák, Ing. Petr Daněček, Ing. Václav Eksler, Ing. Jiří Franek, Ing. Omar Suli O Ghabar, Ing. Miroslav Gregořica, Ing. Martin Habr, Ing. Pavel Hanák, Ing. Pavel Hofírek, Ing. Marek Huczala, Ing. Petr Hujka, Ph.D., Ing. Pavel Kania, Ing. Michal Kohoutek, Ing. Vítězslav Kot, Ing. Jaroslav Koton, Ing. Ivan Koula, Ing. Petr Kovář, Ing. Jiří Krejčí, Ing. Václav Křepelka, Ph.D., Ing. Vítězslav Křivánek, Ing. Martin Kyselák, Ing. Tomáš Langer, Ing. Tomáš Lukl, Ing. Vladimír Malenovský, RNDr. et RNDr. Vladimír Mazálek, Ing. Marek Menšík, Ing. Tomáš Miklánek, Ing. Martin Minarčík, Ing. Pavel Moučka, Ing. Galal Abdo Awad Murshed, Ing. Lukáš Palko, Ing. Karel Polák, Ing. Jiří Přinosil, Ing. Kamil Říha, Ing. Ashraf Abdalla Sherif, Ing. Anna Shklyaeva, Ing. Jaromír Skřipský, Ing. Jaroslav Snášel, Ing. Michal Soumar, Ing. Vojtěch Stejskal, Ing. Martin Sýkora, Ing. Radek Šponar, Ing. Richard Štefíček, Ing. Miroslav Štěpán, Abdurrzzag Giuma A Tamtam, Ing. Stanislav Uchytil, Ing. Milan Vajdík, Ing. Martin Vítek, Ing. Jan Vlach, Ing. Martin Vondra, Ph.D., Ing. Jaroslav Vrána, Ing. Vít Vrba, Ing. Radek Zezula, Ph.D.

Administrative and Technical Staff

Ing. Radim Burget, Jitka Halousková, Jaroslav Klon, Ondřej Kratěna, Magda Lounková, Jaroslav Meixner, MUDr. Svatopluk Nehyba, Pavel Novotný, Lukáš Pazdera, Bc. Lucie Pernicová, Zdeněk Procházka, Bohuslava Raidová, Jitka Šichová, MUDr. Iva Tomášková, Ing. Robert Vích, DrSc.

Main Interests

The Department of Telecommunications has introduced the Bachelor programme study area Teleinformatics. The subject reflects the current convergence of communication and information technologies. Instruction provided at the department seeks balance between mobile and stationary communications, computer systems and networks, design of network applications in various programming languages. 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 Bachelor study programme is followed by the Master study programme Telecommunication and Information Technology and the Ph.D. study programme Teleinformatics.

The department has been successful in obtaining sufficient funding from various research and education projects. The research and development teams at the department were involved in projects relating to basic and applied research in the total amount of over 47 million CZK.

A research team has been engaged in providing up-to-date multimedia services via mobile and wireless networks. Some members of the team have been involved in a research and development programme of the Ministry of Trade and Industry. Close cooperation was established with GiTy a.s., DISK Multimédia s.r.o., WESTCOM s.r.o., ENJOY s.r.o., SEV Litovel, ÚRE, Czech Academy of Sciences, MEgA-Měřicí Energetické aparáty, s.r.o., GTS Czech a.s., AIS s.r.o. a Saturn Holešov. A practical outcome of the research is the development of user-friendly videoconferencing, modular architecture for information and videoconferencing systems, contactless measurement of filtering network, or the development of a new generation communication system, universal architecture for DTV multicast for IP network, etc.

Major Achievements

The main interest of the department are communication systems oriented to mobile and wireless network technologies. In cooperation with Motorola, Ltd. we completed a research laboratory of mobile systems. The major components of the laboratory are a new version of the exchange and the base station BTS, new generation products increasingly used by commercial operators of mobile networks. The base station contains two radio modules at frequencies 900 MHz and 1800 MHz for monitoring of the so called handover of stations in a mobile network. Installation of the new system follows the current trend in the distribution of control functions as in the new version of SoftSwitch MSC exchange control is separated from processing. From the viewpoint of research it is a flexible solution for adaptation to the requirements of newly emerging network services. The distribution of control functions results in a higher processing rate, which is important for research of new user services. The solution reflecting the current development in mobile network technologies is sufficiently universal to be used in the next 10-15 years.

The installed system is ready for use in hybrid 2.5-3 generation networks. It provides a basis for research and development of mobile technology and new UMTS technology. It will be used for research and testing of modern multimedia services for new generation fast mobile networks.

A multimedia computer laboratory for instruction was completed. It is equipped with 27 multimedia two-core work stations with the Core 2 Duo processor, which currently secures the highest possible computing performance of a PC. Each work station contains a high resolution scanning camera Logitech QuickCAM STX, studio headphones AKG K66, the Pinnacle Studio10/500PCI card and the eight-channel card for sound processing in format HD-Audio. Available in the laboratory are 48 gigabite supply mains with two 24-port switches, via optical cables connected to the central mains. The capacity of the network is sufficient for transmission of multimedia signals in HDTV, a videoconferencing system Tannenberg, IP phones, DVB-T receivers and DVB-T server. There is also a multi-channel acoustic system Marantz DV6600/ SR4400 with a set of studio audio monitors Event 20/20.

The department co-organized the international conference ´Telecommunications and Signal

Processing 2006´ and ´Research in Telecommunication Technology 2006´ The department provides technical and administrative support for the Czech electronic journal www.Elektrorevue.cz.

Major Research Projects

Applied Research of Protected Internet Communication with Remote End Power Devices – GA AV ČR 1ET110530523
Investigator: Jiří Mišurec

Distributed Client Services for New Generation Mobile Networks – 1K04116
Investigator: Karol Molnár

Quality Assurance in Mass Radio Network Services – GAČR 102/04/P047
Investigator: Dan Komosný

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

Optimization of Algorithms for Digital Processing of Audiosignals– 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

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

Sophisticated Methods of Support 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

Synchronization of Cipher Block Modes for Modular Cryptographic Systems BRI ISDN a PRI ISDN – ST200520005002
Investigator: Karel Burda

Universal Architecture for Interactive Information Services for Terrestrial Digital TV – GA AV ČR 1ET301710510
Investigator: Karol Molnár

Universal Architecture for Quality Assurance in New Generation Mobile Network – GAČR 102/05/P585
Investigator: Vít Novotný

Research and Application of Time-Frequency Analysis in Logopaedy – MPO FT/072
Investigator: Kamil Vrba

Research and Verification of a System for Recording 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 an Internet Telephone Exchange – MPO FT-TA3/011
Investigator: Zdeněk Smékal

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

Research and Development of Secured GPRS Data Communication System – MPO FT2/073
Investigator: Kamil Vrba

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

Research of Technologies and Systems for Real-Time Processing of Sound – MPO FD-K3/036
Investigator: Jiří Schimmel

Research into Effects of Digitally Controlled Pulse-Magnetic-Laser Field and Development of New Type Medical Apparatus – MPO FT-TA/007
Investigator: Kamil Vrba

Research of User-Friendly Videoconferencing Technology – MPO FD-K3/045
Investigator: Václav Zeman

Highlighting Speech Signal Masked in Noise – GAČR 102/04/1097
Investigator: Zdeněk Smékal

Selected Publications

MIŠUREC, J., VRBA, K., ČAJKA, J. New Universal Biquad Using UCCX Devices. Frequenz, ISSN 0016-1136, 2006, vol. 2006, no. 7-8, pp. 138 - 141.

VRBA, K., JEŘÁBEK, J. Universal Current Conveyor, its real characteristics and example of applications. International Transactions on Communication and Signal Processing, ISSN 1738-9682, 2006, vol. 6, no. 1, pp. 25 - 28.

BARTUŠEK, K., SMÉKAL, Z., GESCHEIDTOVÁ, E. Analysis of MR Image in the Measurement of Magnetic Susceptibility. International Transactions on Communication and Signal Processing, ISSN 1738-9682, 2006, vol. 4, no. 8, pp. 17 - 26.

BURDA, K. Error propagation in various cipher block modes. International Journal of Computer Science and Network Security, ISSN 1738-7906, 2006, vol. 6, no. 11, pp. 235 - 239.

BURGET, R., KOMOSNÝ, D. Real-time control protocol and its improvements for Internet Protocol Television. International Transaction on Computer Science and Engineering, ISSN 1738-6438, 2006, vol. 2006, no. 31, pp. 1 - 12.

CVRK, L., VRBA, V. A novel system of access control for server applications in web environments. International Transaction on Computer Science and Engineering, ISSN 1738-6438, 2006, vol. 2006, no. 35, pp. 186 - 198.

KOMOSNÝ, D. Web-based system for learning of communication protocols. International Journal of Computer Science and Network Security, ISSN 1738-7906, 2006,vol. 6, no. 9B,pp. 38 - 42.

KŘIVÁNEK, V. Verification of the error-control security process by means of simulation. International Transactions on Communication and Signal Processing, ISSN 1738-9682, 2006, vol. 9, no. 1, pp. 128 - 136.

KŘIVÁNEK, V. The Use of Matlab for the Simulation of the Burst Error Correction. International Journal of Computer Science and Network Security, ISSN 1738-7906, 2006, vol. 6, no. 7B,pp. 141 - 145.

MIŠUREC, J. Hysteresis Comparators with Current Conveyors. International Transactions on Communication and Signal Processing, ISSN 1738-9682, 2006, vol. 2006, no. 7, pp. 19 - 29.

MIŠUREC, J., ZEMAN, V. Simulation models of current conveyors for computer analysis. International Transactions on Communication and Signal Processing, ISSN 1738-9682, 2006, vol. 2006, no. 8, pp. 37 - 45.

MURSHED, G., KOMOSNÝ, D. TETRA over IP. International Transaction on Computer Science and Engineering, ISSN 1738-6438, 2006, vol. 31, no. 1, pp. 63 - 73.

RAJMIC, P. Method for Real-Time Signal Processing via Wavelet Transform In Nonlinear Analyses and Algorithms for Speech Processing. 3th International Conference on Non-Linear Speech Processing. Berlin, Germany: Springer, 2006, pp. 368 - 378, ISBN 3-540-31257-9

SNÁŠEL, J., KOMOSNÝ, D. Aspects of Interconnection of Trunked Radio Network and IP Network. International Transactions on Communication and Signal Processing, ISSN 1738-9682, 2006, vol. 4, no. 1, pp. 1 - 12.

ŠPONAR, R., VRBA, K. Measurements and Behavioral Modelling of Modern Conveyors. International Journal of Computer Science and Network Security, ISSN 1738-7906, 2006, vol. 6, no. 3A, pp. 57 - 65.

VRBA, K., JEŘÁBEK, J. Filters Based on Active Elements with Current Mirrors and Inverters. International Transactions on Communication and Signal Processing, ISSN 1738-9682, 2006, vol. 8, no. 1, pp. 1 - 8.

Bachelor's Programme

Accesses and Transports Networks (Vladislav Škorpil)

Analog technology (Kamil Vrba)

Communication technology (Ivo Herman)

Data Communication (Karel Němec)

Design of electronic devices (Kamil Vrba)

Digital Filters (Zdeněk Smékal)

Digital Signal Processing (Jiří Mišurec)

Electroacoustics (Ladislav Káňa)

Hardware 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)

Professional Practice (Václav Zeman)

Signals and systems analysis (Zdeněk Smékal)

Studioengineering (Ladislav Káňa)

Terminal Equipments (Vít Novotný)

Transmission media (Miloslav Filka)

Master's Programme

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

Advanced data transmission technology (Václav Zeman)

Computers and peripheral devices (Miroslav Balík)

Computer-supported solution of engineering problems (Jiří Mišurec)

Cryptography (Václav Zeman)

Design and Technology of Electronics Devices. (Kamil Vrba)

Digital Audio Signal Processing (Miroslav Balík)

Digital Signal Processing (Zdeněk Smékal)

Digital Signal Processors (Zdeněk Smékal)

Electroacoustics (Ladislav Káňa)

Graphic and Multimedia Processors (Zdeněk Smékal)

High-speed Communications Systems. (Vladislav Škorpil)

Information system security (Karel Burda)

Integrated Networks (Vít Novotný)

ISDN Services (Vladislav Škorpil)

Microprocessors Technique in Telecommunications (Miroslav Balík)

Mobile Network Communication Systems (Vít Novotný)

Modern communication technique (Ivo Herman)

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)

Telecommunication Devices Maintenance. (Vladislav Škorpil)

Terminal Equipments (Vít Novotný)

Theoretical Informatics (Václav Zeman)

Theory of Communication (Vladimír Kapoun)

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, Karol Molnár, Vít Novotný)

Laboratory of Digital Music Studio (research and instruction in synthesis, analysis, processing and reproduction of music signals including the multi-channel 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, Karol Molnár)

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

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

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

Laboratory of Access Networks (research and instruction in end devices, efficiency of access networks with regard to wire and wireless media, 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 minimal rate of 10 Gb/s, Vladislav Škorpil)

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

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

Research Laboratory of 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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Doc. Ing. Jarmila Dědková, CSc.
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. Eva Kroutilová, Ph.D., Ing. Miloslav Steinbauer, Ph.D., Ing. Miroslav Veselý, Ing. Martin Zlomek, Ph.D.

Postgraduate Students

Ing. Tibor Bachorec, Ing. Petr Drexler, Ing. Vítězslav Kafka, Ing. Radek Kubásek, Ph. D., Ing. Jiří Macola, Ing. Martin Mareš, Ing. Vratislav Michal, Ing. Zdeněk Pončík, Ing. Tomáš Skoupil, Ing. Tomáš Smutný, Ing. Tomáš Vojtek

Administrative and Technical Staff

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

Main Interests

Research was focused on impedance tomography methods in numerical modelling. Research results were presented at international conferences or published in international journals. Contacts were established with universities in Austria, and USA. Cooperation continues with the Institute of Instrument Technology, Academy of Sciences Brno in evaluation of MR images with the aid of numerical modelling, and evaluation of NMR images in strongly disturbed or distorted NMR signals. Cooperation continued with ABB EJF s.r.o Brno in computer-aided design of measuring transformers. The two-processor station ALTIX and the 16-processor station WOOD were used for extensive tasks. Cooperation with ESB was developed in technology solutions for revitalization of power machines and devices. Within the framework of the Prototypa a.s. projects of the Ministry of Industry and Trade research and development were completed of pulse sources on the principle of MHD, Faraday induction law up to 20GW. Final tests and experiments on prototypes were performed. Cooperation continued with VOP 026 Štenberk, VTUPV in research of a microwave source – vircator in TESLA Vršovice. The product attracted attention of NASA.

Results and experience in measurement and metrology of single ultrashort electromagnetic pulses were presented at international conferences - Hawaii, USA, PIERS Boston - MIT USA. One student working on his diploma thesis was granted a placement at I.S.E.P. and eight students from ISEP Paris were in placements at our department. Cooperation continued with TEROS Loštice. The department was involved in research of the methods for measurement of concentration of air ions, microscopic (nano-) characteristics of materials. Basic and applied research was carried out of the measurement of single electromagnetic pulses as a support of research within the framework of the above mentioned projects. A prototype was made of a calorimetric sensor for measurement of pulse output in free space (Pmax=50kW-300GW), experimental electrooptical measurements of pulses were prepared. Manufactured and demonstrated were prototypes of mini- and macrogenerators for the 6th FP ´WISE- Wireless sensing´ EADS, Dassoult, Eurocopter consortium. Research of mass composition was commenced. The first results relating to models with a phase change of mass and to electrochemical processes were published.

Major Achievements

The department presented conclusions of experimental research of MR measurement of gradient magnetic fields and research of filtration techniques based on Wavelet transform and banks of filters. Also presented were the results of a theoretical research of impedance tomography. A unique prototype was implemented of a sensor for recording of pulse voltage with a pulse length under 100 ns.

An innovated prototype of a pulse power generator based on the MHD principle and a pulse power generator PGV-II were implemented in cooperation with PROTOTYPA a.s. Brno. Four different designs of prototypes of vibration mini- and microgenerators were implemented in cooperation with 6RP WISE, and an industrial model of a part of the vibration generator was registered. A high-voltage pulse resistance voltage divider for measurement on the PGV-II pulse generator was completed. A special light source was tested (high flow of light without an infrared area) for Masaryk University, research of arctic flora. A LVDS bus highly resistant to EMC was designed and implemented. In cooperation with ABB EJF s.r.o., a special sensor of voltage and current was designed and implemented. A unique prototype of a 16-processor station WOOD was constructed. Cooperation with the commercial sector.

A unique method was devised of numerical analysis of noise effects on the measuring voltage transformer TJP6 and the measuring current transformer TPU6 from ABB EJF s.r.o. In cooperation with VOP Šternberk the department completed a study for modelling of filters in EMC testing. Cooperation has continued with PROTOTYPA a.s., and started with SIEMENS s.r.o, EADS, EUROCOPTER, DASSAULT AVIATION. Laboratoriem I: New equipment was added to research laboratories. Cooperation with Professor

Hiroshi Kikuchi continued, meeting in Boston - MIT USA, basic research of microscopic electro-hydrodynamic models for biomedical engineering, Tokyo University.

Major Research Projects

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

Selected Publications

BARTUŠEK, K., GESCHEIDTOVÁ, E. Testing the quality of magnetic gradient fields for studying self-diffusion processes by magnetic resonance methods. Measurement Science and Technology (IF = 1.118), ISSN 0957-0233, 2006, vol. 2006, no. 17, pp. 2256 - 2 262.

BARTUŠEK, K. Processing of MR images weighted by relaxation time T2 to increase their contrast resolution. Measurement Science and Technology, ISSN 0957-0233, 2006, vol. 17, no. 4, pp. 727 - 1 456.

BARTUŠEK, K., DOKOUPIL, Z., GESCHEIDTOVÁ, E. Magnetic field mapping around metal implants using an asymmetric spin-echo MRI sequence. Measurement Science and Technology, ISSN 0957-0233, 2006, vol. 17, no. 12, pp. 3293 - 3 300.

BARTUŠEK, K., GESCHEIDTOVÁ, E. MR Measurement Technique of Rapidly Switched Gradient Magnetic Fields in MR Tomography. Applied Magnetic Resonance, ISSN 0937-9347, 2006, vol. 29, no. 12, pp. 675 - 686.

BARTUŠEK, K., SMÉKAL, Z., GESCHEIDTOVÁ, E. Analysis of MR Image in the Measurement of Magnetic Susceptibility. International Transactions on Communication and Signal Processing, ISSN 1738-9682, 2006, vol. 4, no. 8, pp. 17 - 26.

BUCHTA, Z., RYCHNOVSKÝ, J., LAZAR, J. Optical pumping of Rb by Ti:Sa laser and high-power LD. Journal of Optoelectronics and Advanced Materials, ISSN 1454-4164, 2006, vol. 2006, no. 1,pp. 350 - 354.

FIALA, P., DREXLER, P. Sensors and Methods for Electromagnetic Pulse Identification. Sensors & Transducers, ISSN 1726-5479, 2006,vol. 74, no. 12, pp. 844 - 854.

GESCHEIDTOVÁ, E., KUBÁSEK, R., BARTUŠEK, K. Methods for Signal Filtering in NMR tomography. International Transactions on Communication and Signal Processing, ISSN 1738-9682, 2006, vol. 4, no. 4, pp. 25 - 34.

KUBÁSEK, R., STEINBAUER, M., BARTUŠEK, K. Material influences in MR tomography, measurement and simulation. Journal of Electrical Engineering, ISSN 1335-3632, 2006, vol. 2006, no. 8/S, pp. 58 - 61.

KUBÁSEK, R., GESCHEIDTOVÁ, E., BARTUŠEK, K. Quality of Gradient Magnetic Fields Estimation. Journal of Electrical Engineering, ISSN 1335-3632, 2006, vol. 2006, no. 8/S, pp. 54 - 57.

Bachelor's 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 (Jarmila Dědková)

The C++ Programming Language (Pavel Fiala)

Master's Programme

Electrical installations (Pavel Kaláb)

Safe electrical engineering (Pavel Kaláb)

Electromagnetic field modeling (Jarmila Dědková)

Doctoral Programme

Numerical Computations with Partial Differential Equations (Libor Dědek)

Special Measuring Methods (Karel Bartušek)

Laboratories

Research Laboratory of Magnetic Measurement (Jiří Rez)

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

Laboratory for Measurement in Electrical Engineering A (instruction in subject BMVA, Eva Gescheidtová)

Laboratory for Measurement in Electrical Engineering B (instruction in subject BMVA, Eva Gescheidtová

Laboratory of Electrical Engineering (instruction in subjects BEL1, BEL2, Milan Murina)

Computer Laboratory for Electrical Engineering (instruction in subjects BEL1,BEL2 , Miloslav Steinbauer)

Computer Laboratory (instruction in subjects BPC2, BSCP, DQT1, BELS, Miloslav Steinbauer)

Research Laboratory of Optoelectronic Systems (research of optoelectronic measuring methods and numeric modelling methods, Eva Kroutilová)

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

Research Laboratory of Numeric Modelling 1 (research laboratory of complex numeric assignments)

Research Laboratory of Numeric Modelling 2 (research laboratory of electronic circuits modelling, models with centred parameters, Miloslav Steinbauer)

Research Laboratory of Electric Circuits (research laboratory for Ph.D. students, Jiří Sedláček)

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

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

Department of Power Electrical and Electronic Engineering

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Head

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Prof. Ing. Karel Hruška, DrSc.
Prof. Ing. Jiří Skalický, CSc.

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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.

Postgraduate Students

Ing. František Blažek, Ing. Tomáš Cibulka, Ing. Ivan Civín, Ing. Dalibor Červinka, Ph.D., Ing. Jiří Duroň, Salem Sherif Elfard, Ing. Petr Frank, Ing. Pavel Gajdůšek, Ing. Jan Hájek, Ing. Petr Hapal, Ing. Petr Hemerka, Ing. Jiří Hnízdil, Ing. Aleš Honzák, Ing. Marcel Janda, Ing. Martin Jarmara, Ing. Emil Kalina, Ing. Tomáš Kerlin, Ing. Jiří Klíma, Ing. Marek Klimeš, Ing. Roman Kostka, Ing. Zdeněk Langr, Ing. Tomáš Láníček, Ing. Miloš Machat, Ing. Martin Maňa, Ing. Tomáš Matucha, Ing. Petr Melichar, Ing. Jan Novotný, Ing. Radim Peřina, Ing. Lubomír Přikryl, Mohamed Abdusalam Shaban Ali, Ing. Luboš Sikora, Ing. Radek Stupka, Ing. Alice Špérová, Ing. Filip Štěpančík, Ph.D., Ing. Pavel Štorek, Ing. Radek Trávníček, Ing. Zdeněk Tulis, Ing. Ferdinand Urban, Ing. Jiří Valenta, Ph.D., Ing. Ondřej Vítek, Ph.D., Ing. Miroslav Zemánek, Ing. Jakub Žajdlík

Administrative and Technical Staff

Josef Daněk, Ing. Petr Dohnal, Ph.D., Ing. Zdeněk Feiler, Ph.D., Zdeněk Koráb, Zdeněk Liška, Ing. Petr Melichar, Alena Šmídková

Main Interests

The department provides instruction in the study area Power Electrical and Electronic Engineering in Bachelor, Master and Doctoral degree programmes. Besides theoretical subjects, instruction is provided in basic disciplines such as theory and construction of electric machines and devices, recently also CAD systems, including solutions of electromagnetic and thermal fields and design optimization methods. Modern disciplines in the focus of attention are power electronics and its applications in electric drives and supply systems, theory of management and control and its application in the design of complicated dynamic systems and technological processes, and automotive technology and electronics and automated measurement systems.

Research is centred on basic research of theoretical modelling of radiation energy transport in thermal plasma. Applied research is 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. The department has also been engaged in research of electric energy converters of extreme parameters, utilization of ultracapacitors in cooperation of electronic converters, batteries and electric machines in electric traction.

Long-term research and innovation has been in progress of sliding contacts, targeted at improving operating characteristics of electric machines. The department has had cooperation with a number of technical universities e.g. TU Gliwice, TU Delft, TU Košice, TU Žilina, MU Brno, TU Pskov, TU Omsk and industrial companies and institutions, e.g. Siemens AG - Corporate Technology, 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. and other.

Major Achievements

In cooperation with the company VÚES Brno, a.s., the sliding contact of an asynchronous slip ring generator has been innovated for airport operation with S=430kVA, U=400V, I=670A, n= 1600÷2300 min-1, LFC 554 L´ Carbon fitted with brushes of excellent operating characteristics.

Designed, developed and implemented were two operating samples of a converter for reluctance motors.

The digital control of reluctance electromotor was implemented.

In cooperation with Faculty Hospital Brno, Neurosurgery Clinic, we designed and implemented a dynamometer to be used for assessment of after-operation condition of patients.

Designed and implemented was an electric drive for heart support pump with a synchronous disc motor with PM controlled by a magnetic bearing

Within the framework of the 6th Framework Programme of EU, we developed and implemented a vibration microgenerator for independent feeding of sensors.

The department organized the national conference ´EPVE 2006´ with participation of Czech and Slovak researchers.

Prototypes of two new electric machines were completed within the framework of projects of the Ministry of Industry and Trade: a wiper motor for service vehicles and buses including electronic regulation of revolutions and a new gear mechanism (in cooperation with APS, a.s. Světlá nad Sázavou), and an alternator 14 V, 140 A for agricultural and special machinery (in cooperation with MAGNETON a.s. Kroměříž). Series production of the machines is currently starting. The wiper motor was exhibited at AUTOTEC 2006 and came second in the Autotec competition.

The department organized the international conference ´Low Voltage Electrical Machines´.

In 2006, the department won the Leonardo da Vinci EU pilot project „E-learning Distance Interactive Practical Education (EDIPE)“, with other 12 participating technical universities from central and western Europe and Greece.

Major Research Projects

Asynchronous Chain Saw Engines – MPO FI-IM2/094
Investigator: Vítězslav Hájek

Automation of a Universal Lock for Ballistic Meters – FI-IM2/050
Investigator: Čestmír Ondrůšek

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

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

Alternator without Slip Rings for Agricultural and Special Machinery – MPO FI-IM/199
Investigator: Vítězslav Hájek

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

Assessment of Constructions Exposed to Extremely Rapid Loading – FT-TA3/073
Investigator: Čestmír Ondrůšek

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

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

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

Control of Converters in Electric Drives for Ecological Transport Systems – GAČR 102/03/D222
Investigator: Bohumil Klíma

Methods and Procedures for Assessment of the Piercing and Blasting Effect of Ammunition – FT-TA/029
Investigator: Čestmír Ondrůšek

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

Impact of External Fields on the Characteristics of Electric Arc – GAČR 102/04/2090
Investigator: Zdeněk Vávra

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

Research and Development Generators over 800 mm – MPO FI-IM2/033
Investigator: Čestmír Ondrůšek

Selected Publications

BARTLOVÁ, M., AUBRECHT, V. Photoabsorption of diatomic molecules. Czechoslovak Journal of Physics, ISSN 0011-4626, 2006, vol. 56, no. Suppl. B, pp. B632 - 5.

JENIŠTA, J., BARTLOVÁ, M., AUBRECHT, V. Properties of arc discharge with hybrid stabilization. High Temperature Material Processes: An International Journal, ISSN 1093-3611, 2006, vol. 10, no. 4, pp. 501 - 513.

JENIŠTA, J., BARTLOVÁ, M., AUBRECHT, V. Performance of water and hybrid stabilized electric arcs: the impact of dependence of radiation losses and plasma density on pressure. Czechoslovak Journal of Physics, ISSN 0011-4626, 2006, vol. 56, no. Suppl. B, pp. B1224 - 6.

VESELKA, F. Novyje podchody k voprosam ulučšenija kommutacionnych svojstv električeskich mašin s kollektorom. Mežvuzovskij tematičeskij sbornik naučných trudíc, OMGUPSa 2006, 2006, vol. 2006, no. 3, pp. 57 - 65.

Bachelor's Programme

Automobile Electric and Electronic Systems (Vítězslav Hájek)

Computational Visualization and Animation (Hana Kuchyňková)

Computer aided Design (Hana Kuchyňková)

Computer methods in High Power Engineering (Radek Vlach)

Computer Science in High Power Engineering (prof. RNDr. Vladimír Aubrecht)

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 technics for drives (Miroslav Patočka)

Power electronics (Jaromír Vrba)

Master's Programme

AC drives (Jiří Skalický)

Adaptive and Optimal Control of Drives (Jiří Skalický)

Computer modelling in power electrical engineer(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)

Electrical Controlled Drives (Jiří Skalický)

Electrical microdrives (Josef Koláčný)

Electric Equipments for Motor Vehicles (Vítězslav Hájek)

Electric Machines and Apparatus Design (Zdeněk Vávra)

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 electrical machines and apparatuses (František Veselka)

Laboratory of Electric Drives (Josef Koláčný)

Microcomputer control of electrical drives (Miroslav Patočka)

Microcomputer control of electrical drives. (Jiří Skalický)

Micromachines (Vítězslav Hájek)

Nondestructive Testing and Monitoring (Karel Hruška, DrSc.)

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)

Protection in Heavy Current Engineer (Jaromír Vaněk)

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

Laboratory of Electric Machines (commutation of electric machines, measurement of medium-power outputs, magnetic bearings, automated measurements, Čestmír Ondrůšek)

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

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

Laboratory of Electric Apparatus (research of switching devices, Jaromír Vaněk)

Laboratory of Electric Arc (optical diagnostics of switching arc in high-voltage switches, Zdeněk Vávra)

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

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

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

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

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

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

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

Laboratory of Quality Assurance and Testing (non-destructive diagnostics and monitoring, uncertainty of measurement in NDT, research of empirical models for multiparametric evaluation of quality parameters, Josef Bradík)

Laboratory of Mechatronics (Čestmír Ondrůšek)