ANNUAL REPORT 2005

FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

BRNO UNIVERSITY OF TECHNOLOGY

Contents

Introduction

History

Brno University of Technology (BUT) is the second largest and the second oldest technical university in the Czech Republic. It was founded in 1849 for technical, agricultural and commercial specializations. The languages of tuition were Czech and German. In consequence of political and national disputes Czech gradually ceased to be used as a language of tuition until in 1899 the Czech Technical High School was established in Brno. After World War I and the founding of Czechoslovakia this school merged with the German Technical School (originally bilingual) to form the High Technical School in Brno (later bearing the name of Dr. Edvard Beneš, the second President of Czechoslovakia). In the period between World War I and World War II this 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 2005

In 2005 the Rector of Brno University of Technology was Prof. Jan Vrbka. The Vice-Rector for External Relations was Jiří Kazelle, Professor at the Department of Electrotechnology and one of the leading personalities of the Faculty.

In 2005 Prof. Radimír Vrba was in the office as elected Dean of the Faculty of Electrical Engineering and Communication , together with four vice-deans. At the end of 2005, there were 189 teachers and 4,201 students in all forms of state-supported study programmes. Moreover, education was provided to 250 students of the Faculty of Information Technology and 16 students of the

Faculty of Mechanical Engineering. On the other hand, tuition was purchased from the Faculty of Business and Management for 27 students and from the Faculty of Information Technology for 12 students. As a result, education activities of FEEC can be quantified by the total number of 4,428 students. Education was provided in the ending study programmes Electrical Engineering and Computer Science (EI) on one hand, and in the newly composed structured programmes Electrical Engineering, Electronics, Communication and Control Technology (EECR) accredited in 2001 in accordance with the Bologna Declaration. The study programmes at FEEC are now

3

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 2005 there were 381 students who completed their studies in the Bachelor's degree programme, 194 Master's degree graduates, and 37 postgraduates completed their doctoral studies. There were 1,727, 365 new students who started their studies at the Faculty, 365 students entered the follow-up Master's study programme, and 49 graduates entered the doctoral degree programme. Tuition in English was provided to 46 foreign students paying their fees. Eleven academics (two women and nine men) were habilitated and appointed associate professors with the title Docent. There was one appointment to professorship.

Events and Activities

- meeting of the former deans of FEEC and the Rector of the Brno University of Technology on the occasion of the 100th birthday of Professor Jiří Brauner, one of the first deans of the Faculty of Electrical Engineering of the Brno University of Technology

- traditional faculty ball at the Voroněž hotel

- meeting of the leaderships of the Czech and Slovak faculties of electrical engineering and associated faculties in Plzeň, June 26-28

- first graduates in the study programme Electrical, Electronic, Control and Communication Technology (EECR) – one of the goals of the long-term development of the Brno University of Technology

- commencement of the first year of the Master's degree programme EECR in academic year 2005/06

- application for extended accreditation of the follow-up Master's degree programme EEKR-M to the Ministry of Education, accreditation extended until 2009

- participation in GAUDEAMUS 2005, 1-4 November 2005, and presentation of the new study programmes offered at the faculty in an atypical stand to promote FEEC and arise interest of secondary school students in study at FEEC

- activities of Assoc. Prof. Pavel Jura, Vice-Dean for the Master' s degree programme, focused on the development of the combined and distance formats of study in the new structured study programme supported by the Development and Transformation Projects of Ministry of Education

- creation of 29 titles of electronic texts of the total extent of 3, 088 pages

- successful completion of the first year of part-time study in the Bachelor's degree programme EECR for 233 students

- activities of Assoc. Prof. Jarmila Dědková, Vice-Dean for the Bachelor's degree programme, focused on widening the range of Bachelor's study programmes and on increasing the standards of study in the new structured programmes EECR

- preparatory courses for secondary-school students interested in study at FEEC organized to help them prepare for entrance examinations in mathematics (140 applicants) organized by the Departments of Mathematics

- organizing Open Door Days (14 January and 28 January 2005), visits by students and teachers to secondary schools

- activities of Prof. Zbyněk Raida, Vice-Dean for Research focused on lifelong education, mainly in procedures leading to granting the title of docent or professor

- STUDENT EEICT 2005 Conference and Competition organized in cooperation with the Faculty of Information Technology and sponsored by the company Tyco and others, with 46 Bachelor's papers, 62 participants in the Master's section, and 132 participants in the Doctoral section

- organization, in cooperation with the Faculty of Information Technology and Faculty of Mechanical Engineering, of the international round of the student conference and competition HONEYWELL EMI 2005 sponsored exclusively by the company HONEYWELL, with selected 6 Bachelor's, 16 Master's and 37 Doctoral papers

- acquisition of significant financial support from the firm HONEYWELL for research targeted at the firm's professional interest and for purchasing mechatronic laboratory equipment

- activities of Prof. Ivo Provazník, Vice-Dean for External Relations, and Prof. František Zezulka, focused on participation in the ERASMUS-SOCRATES programme and other European programmes

- development of the faculty information system and faculty websites

- activities of faculty secretary Miloslav Morda mainly concerned with completion of integrated premises Pod Palackého vrchem for the departments of control and instrumentation, biomedical engineering and theoretical and experimental electrical engineering, and reconstruction at T8

- activities of the Dean and faculty secretary focused on the 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

- first year of the three new research plans of FEEC for the period 2005-2009 (2011) with the main investigators Jiří Kazelle, Jiří Svačina and Radimír Vrba

- opening of the Laboratory of Integrated Circuit Design at the Department of Microelectronics, equipped with support from ON Semiconductor and CADENCE

- activities of the Chairman of the Academic Senate of FEEC Vlasta Krupková in her capacity as a member of the Higher Education Council

- activities of the Chairman of Academic Senate Vlasta Krupková focused on the organizational and economic aspects of the development of FEEC

- activities of the 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

- activities of Prof. Jiří Skalický and namely Prof. Jaromír Brzobohatý and Jarmila Jurášová concerned with the 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

- Academic Senate elections, Vlasta Krupková was elected chairman of Academic Senate and Petr Polách was elected chairman of the student part of Academic Senate

- student Jiří Piškula was appointed Advisor to the Dean for student affairs

- Vlasta Krupková, Eva Gescheidtová and student Tomáš Žabka were elected members of the Academic Senate of Brno University of Technology

- a new student magazine E-FEKT was started, the editor-in-chief is student Jiří Piškula, Academic Senate elected the serving Dean Radimír Vrba candidate for the Dean for the period February 2006 to January 2010.

Achievements

In 2005 the 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 Grant Agency of the Czech Republic, the Higher Education Development Fund and mainly owing to the efforts of all those who under the leadership of the main investigators participated in research plans and the Research Centre.

The number of students increased by over 600, and thus the Faculty contributed to the declared dynamic development of the Brno University of Technology confirmed by the long-term plan. All staff members and postgraduate students of FEEC deserve appreciation and my gratitude.

Radimír Vrba, Dean

Faculty of Electrical Engineering and Communication

Dean
Prof. Ing. Radimír Vrba, CSc.

Vice-Deans
Prof. Ing. Pavel Jura, CSc.
Acting Dean, Vice-Dean for Master's Degree Programme

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

Prof. Dr. Ing. Zbyněk Raida
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
Jan Mertl, Jiří Piškula (from 1 September 2005)

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

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

Departments

Department of Control and Instrumentation
Department of Biomedical Engineering
Department of Electrical Power Engineering
Department of Electrotechnology
Department of Physics
Department of Languages
Department of Mathematics

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

Scientific Board

Internal Members

Prof. Ing. Libor Dědek, CSc.
Doc. Ing. Jarmila Dědková, CSc.
Doc. Ing. Evžen Haluzík, CSc.
Prof. Ing. Tomáš Hruška, CSc.
Prof. RNDr. Jan Chvalina, DrSc.
Prof. Ing. Jiří Jan, CSc.
Doc. Ing. Pavel Jura, CSc.
Prof. Ing. Jiří Kazelle, CSc.
Doc. RNDr. Milena Kheilová, CSc.
Prof. Ing. Vladislav Musil, CSc.
Doc. Ing. Čestmír Ondrůšek, CSc.

Doc. Ing. Ivo Provazník, Ph.D.
Prof. Dr. Ing. Zbyněk Raida
Doc. Ing. Karel Rais, CSc., MBA
Prof. Ing. Václav Říčný, CSc.
Prof. Ing. Jiří Skalický, CSc.
Prof. Ing. Zdeněk Smékal, CSc.
Prof. Ing. Jiří Svačina, CSc.
Prof. Ing. Petr Vavřín, DrSc.
Prof. Ing. Kamil Vrba, CSc.
Prof. Ing. Radimír Vrba, CSc.

External Members

Ing. Milan Findura, Ph.D.
RNDr. Luděk Frank, DrSc.
Ing. Aleš John
Prof. Ing. Vladimír Kučera, DrSc.
Doc. Ing. Aleš Richter, CSc.
Ing. Ivan Skalka

Prof. Ing. Zbyněk Škvor, CSc.
Doc. RNDr. Vítězslav Veselý, CSc.
Ing. Robert Vích, DrSc.
Ing. Rostislav Vinkler
Ing. Jiří Winkler, CSc.

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Accredited Programmes and Study Areas

Accredited Study Programmes

Bachelor's 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's 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's and Master's Degree Programme Electrical Engineering and Computer Science

In 2005 there were still students in the ending full-time five-year study programme Electrical Engineering and Computer Science (EI), the follow-up three-year Master's programme EI and the three-and-a-half Bachelor's programme EI. There were 209 graduates in these three programmes in study areas Electrotechnical Manufacturing and Management (EVM), Cybernetics, Automation and Measurement (KAM), Electronics and Communications (EST) and Power Electrical and Electronic Engineering (SEE).

In the five-year Master's programme EI a total of 193 students graduated in 2005, 84 in EST, 36 in KAM, 33 in SEE and 40 in EVM.

In the three-year follow-up Master's degree programme EI there were 6 graduates in 2005, 2 in EST and 4 in EVM.

Statistics of the numbers of graduates in individual Master's specializations are shown in Table 1.

In the three-and-a-half-year Bachelor's degree programme EI there were 10 graduates, 2 in EST, 2 in SEE and 6 in EVM.

In the three-and-a-half-year Bachelor's degree programme EI there were 12 graduates,2 in EST, 2 in SEE and 6 in EVM.

In the study programme for students paying their fees there were 46 students from abroad, 26 of them in the ending five-year study programme EI (7 in SEE, 1 in EVM and 18 in EST) and 20 students in the new three-year Bachelor's degree programme (12 in specialization TLI, 8 in MET).

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 start full-time study at FEEC without being required to pass entrance examination, and earned credits will be recognized. In 2005 there were 32 students in the lifelong education programme.

The teachers of FEEC participated in tuition organized by the University of the Third Age, which has entered its fifth year at the Brno University of Technology.

Table 1: 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
EVM	37	53	37	71	44
KAM	64	61	68	67	36
EST	108	105	130	132	86
SEE	48	72	59	58	33
Total	257	291	294	328	199

The regular assessment of the quality of teaching took place, in 2005 for the first time with the aid of the faculty information system, and the results were published.

Transition from the formerly used administration system STUDENT to the new information system was nearly completed. Enrolment in courses and classes (students prepare their own timetables), selection of topics for semester projects and Bachelor's projects, registration for examinations, point evaluation (points received during the semester and in final evaluation), credits and examinations are recorded in the information system only.

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

The year 2005 saw the start of the second year of part-time study in the Bachelor's study programme EECR and the first-year Master's degree programme EECR. Enrolled in the first year were 362 students, 35 out of them in Biomedical and Ecological Engineering (M-BEI), 21 in Electrical Power Engineering (M-EEN), 90 in Electronics and Communications (M-EST), 22 in Electrotechnical Manufacturing and Management (M-EVM), 37 in Cybernetics, Automation and Measurement (M-KAM), 20 in Microelectronics (M-MEL), 16 in Power Electrical and Electronic Engineering (M-SVE), and 121 in Teleinformatics (M-TIT).

Work continued on lecture notes and other electronic study texts and exercises, mainly for the first year of study. There are 90 subjects in the Master's degree programme, and electronic texts were prepared for 21 subjects, and also for another 5 subjects of the Bachelor's degree programme. For some subjects, electronic texts were created for self-study on one hand and for computer and laboratory work on the other. Altogether, 29 electronic texts were created of the total extent of 3,088 pages.

In 2005 there were 485 students in the third year of the new Bachelor's degree programme Electrical, Electronic, Communication and Control Technology (EECR) 46 in Automation Technology (B-AMT), 18 in Electronics and Communications (B-EST), 33 in Microelectronics (B-MET), 36 in Power Electrical and Electronic Engineering (B-SEE) and 128 in Teleinformatics (B-TLI). There were 63 students in the study area B-AMT, 156 in B-EST, 39 in B-MET, 44 in B-SEE, and 149 in B-TLI. 124 students continue their studies.

Admission procedure is a priority of the Faculty. It took place on 7 and 8 June 2005. Applications for both full-time and part-time formats of study were accepted. As in the previous year, applicants were required to do tests only in an optional combination of mathematics and physics or of 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 the highest average grade 2.0. The maximum possible number of points to be attained in each subject was 50. Those who had attained at least 12 points in each subject were admitted. Also admitted at FEEC were applicants who had passed entrance examination, and those who were exempt from the examination. 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 2005 there were 2,169 applicants for study at FEEC, 1,873 for full-time study. 1,488 were admitted in full-time study and 233 in part-time study. Finally, 1,091 students enrolled in full-time study and 205 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 the numbers of applicants, admitted and enrolled students since 1992. It is apparent from the chart that owing to newly offered part-time study the number of admitted students is higher than in the previous year.

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 2005/06 are in Table 2.

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 the previous academic year, 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 appren 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 with school-leaving examination (SOU), see Graph 3.

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 140. The course in physics was cancelled for lack of interest.

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 12th GAUDEAMUS fair.

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

Table 2: Interest in study areas in the Bachelor's 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)

Academic 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	102	1021
	%	16,6	26,2	8,1	13,1	36,0		
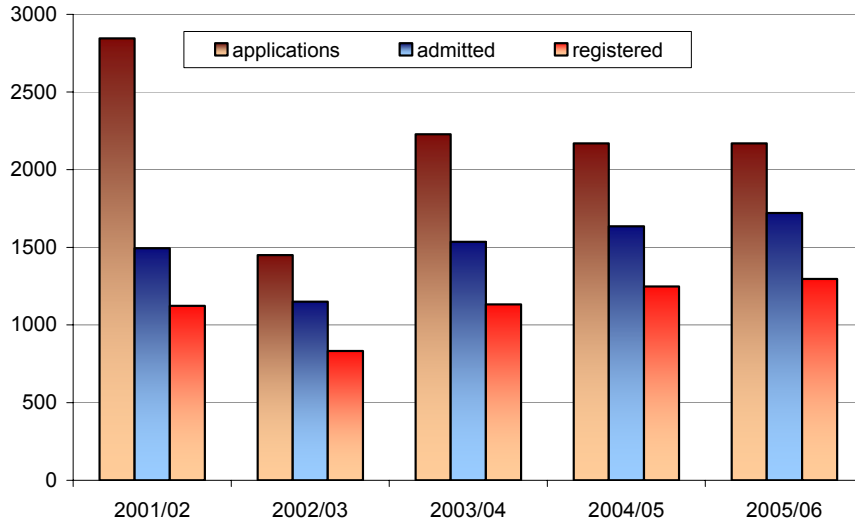
Graph 1: Applicants, admitted and enrolled students in academic years 2001/02 – 2005/06 (before 2001 at the former FE or FEI before the founding of FIT) 1:
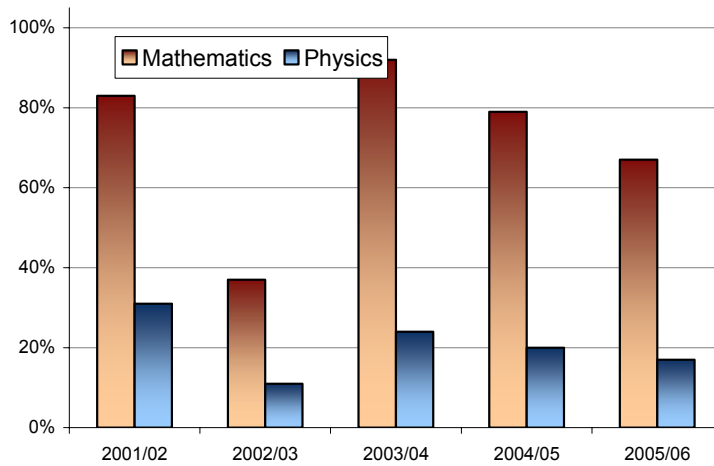
Graph2: Percentages of students who have taken the school-leaving examination in mathematics or physics

14
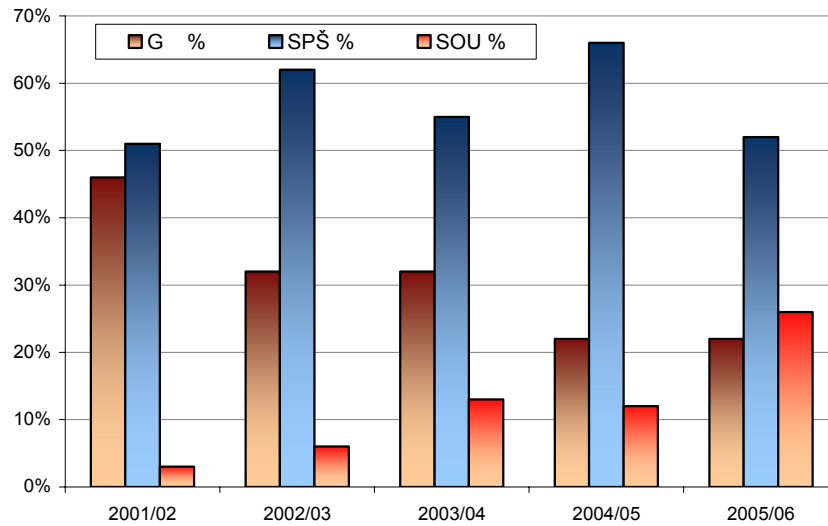
Graph3: Percentages of students coming from different types of secondary schools (G – secondary schools, SPŠ – secondary technical schools, SOU – vocational training centres)

Research and Postgraduate Study

Research

Growth in research activities was observed in 2005, both in terms of funding and quality of research results.

As compared with the previous year, the funding obtained for research (graph 4) increased by approximately 35%. Major sources were three new research plans followed by projects of the Grant Agency of the Czech Republic (GACR) and projects of the Higher Education Fund (FRVS).

Results of original research and professional work at FEEC were published in three international and eight national monographs and in 32 articles in impact journals.
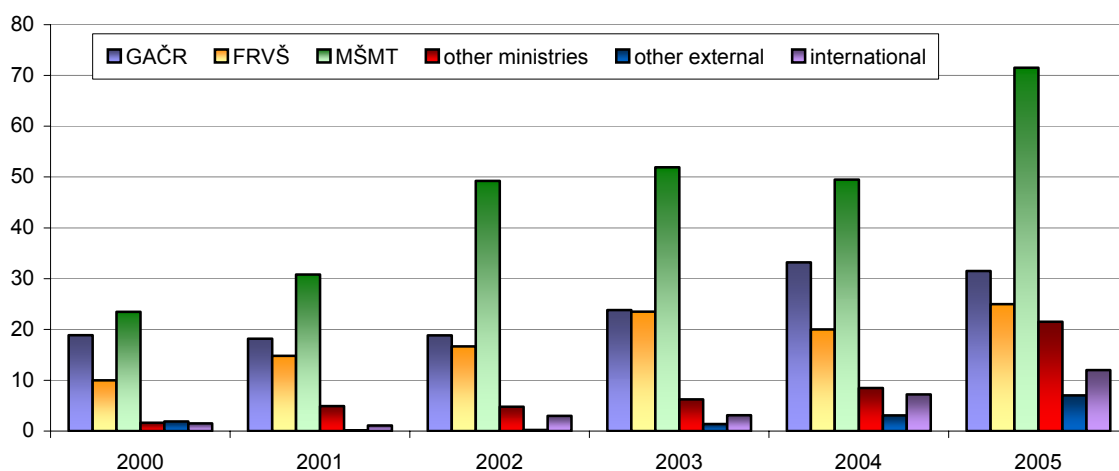
Graph 4: Research funds at FEEC (until 2001 FEI) in millions of CZK in the period 2000 - 2005

Research Plans, Research Centre

Work on three new research plans was started in 2005. Brief evaluation of research results 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 core of research is study of integrated circuits and systems and their elements from the viewpoint of system and technology. The research is based on and supported by modelling and simulation of semiconductor circuits and structures, their diagnosing and development of implementation technology.

Involved in research carried out in the years 2002-2004 were members of academic staff and postgraduate students from the departments of Microelectronics, Radioelectronics, Control and Instrumentation, Telecommunications, Physics, Mathematics, 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 39 participants in category D1, 13 in category D2 and 4 in category D3 – 9 professors, 14 associate professors, over

15 lecturers and senior lecturers, a technical staff of 27 and around 43 full-time doctoral students participated in the research plan.

The research plan covered five professional fields in which the following major results have been achieved:

1. Theory, design and diagnostics of low-voltage and low-power integrated circuits (IO) in submicron technologies: Development of a new active element CCTA (Current Conveyor Transconductance Amplifier) for current analog signal processing which seems to be suitable for sensor signal processing. The CCTA input is a current conveyor CCII followed by a transconductance stage with two outputs. Alternative inner CCTA structures were designed for the CMOS technology for various applications. Positive characteristics and limitations of different connections were studied. One of the output structures was implemented in the AMIS CMOS07 technology. Further investigated was utilization of SC and SI technology in low-voltage AD converters. Several new principles and structures were designed and simulated.

2. Modelling and simulation of integrated circuits: The process of extracting the nominal values of the HSPICE parameters of the electric model were verified, which included input data generation for DESSIS, file generation for HSPICE and identification of the parameters of the incorporated HSPICE model for the NMOS transistor and the bipolar transistor. In modelling and nanostructure simulation transport of electrons over potential barriers under various conditions was studied. Kinematic effects were modelled due to different effective masses of electrons on both sides of the barrier. An improved method was developed of sensitivity analysis in hybrid systems containing elements with concentrated and distributed parameters. In the mathematical support of the project attention was paid to the behaviour of continuous dynamic systems described by differential, integral and integro-differential equations.

3. Microsystems and nanosystems: A number of sensors were created with different types of operating electrodes on the basis of pastes of carbon nanotubes. A method was designed for creating regular nanostructures on electrode surface and thus increasing their sensitivity. A new device was designed – a potentiostate to be connected via USB with the program medium for automatic measurement, setting, compensation and data collection. Designed and implemented

was an integrated multi-range current source for conductometer and polarity switches. An embedded system of lift cage and deck control with AS-Interface communication network. Design and development of wireless data acquisition from thermal sensors, with autonomous delayed data transfer mode. Design of software for the system itself, for the testing the system and data processing in personal computers.

4. Advanced microelectronic and nanoelectronic technologies: The process of lead-free soldering in surface-mounting technology was studied, namely application of lead-free soldering alloyes in manual soldering. In thick-film technology the smallest distinction line/gap in standard procedure was the objective of investigation. Designed and produced was a new testing motive, and experimental testing was completed. In thick-film sensors the focus of investigation was the dependence of electrochemical output signal on material and technological sensor parameters and properties of electrode reaction on operating electrode, and subsequent optimization of their production. The solar panel with thick-film rest contacts was tested. The ANSYS program was applied in modelling of microelectronic structures, namely for soldered contacts reliability simulation focused on thermomechanical stress. A workplace is being set up for soldered contacts reliability testing using LF solder, in cooperation with SMT plus.CZ, s.r.o.

5. Modern diagnostics of materials and components: Analysis of 1/f and RTS noise in CdTe samples, mainly for radiation detection, in which experiments detected localized states, and 1/f noise was the reliability indicator. Research of local optical effects in InAs/GaAs heterostructures with quantum dots and artificial molecules. Local photoluminescence spectra found in these structures correspond with absorption maxima inside bands. Work continued on experiments for laboratory equipment. Operation of the workplace for measurement of traps and dielectric relaxation at low temperatures started. DRS was used for study of exposition time effect in dynamical materials and for study of the effect of the size of particles on dielectric characteristics of composites.

Research results were published in one monograph, 34 articles in international journals, 102 papers presented at international conferences, and in 238 publications and conferences in the Czech Republic. There were seven habilitations

and dissertations, and 15 research reports were completed.

In connection with their research work within the framework of the research plan the members of the team were in 2005 involved in three international projects, 17 GACR projects, 21 FRVS projects, 6 projects of the Ministry of Trade and Industry, two Academy of Science 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 electronic communication circuits, signals and systems within the entire communication chain. Transmitted signals, transmission paths and technologies in perspective multimedia systems are studied. The research plan scheduled up to 2011 is focused on new communication technologies. It is targeted at original research of new communication structures, methods and solutions, research of efficient techniques of multimedia signals processing and advanced technologies for new generation communication systems.

Involved in the research plan in 2005 were 13 professors, 24 associate professors, 33 lecturers and about 90 full-time postgraduate students and 19 technical staff from the Departments of Radioelectronics, Telecommunications, Biomedical Engineering and Theoretical and Experimental Electrical Engineering.

The research plan covered six study areas where the following results were achieved in 2005:

1. New generation wireless and mobile wideband communication systems: The UMTS network modelling and planning, investigating interference effects in the cell on its capacity. Creating an experimental mobile GSM network with support of voice and data services. Analysis of access communication processes and setting up a workplace for measurement of selected Bluetooth system characteristics. Measurement of atmospheric transmission medium characteristics for atmospheric optical connections, building special testing connections in Brno and Prague. Design and implementation of an optical receiver with avalanche photodiode operating in photon counter mode. Research into digital predistortion linearization of power amplifiers. Development of

less sophisticated computation method for reduced OFDM signal envelope dynamics.

2. Multimedia and hypermedia communication services and technologies: development of new methods of cryptographic data transmissions in H.323 networks. Research of the distribution of multimedia data flow via internet by means of Windows Media. Design of a hierarchical structure of subscriber points of junction for multicast multimedia data distribution via RTP data flow. Design of universal architecture application interface based on distributed data processing. Compression of moving images for videoconferencing mainly in DVB-T networks.

3. High-frequency and microwave communication systems: Theoretical analysis of digital coherent detection with synchronizer with estimation of the carrier and symbol timing phases. Design and implementation of a phase-carrier controlled oscillator as a backup frequency standard for the AMSAT P3E satellite. Samples have been sent for tests. Computation of a wide-band microwave vector analyzer on the principle of hexagon, operating sample implementation. Development of time-domain moment-area method for efficient, precise and stable analysis of planar aerials, development of a special planar multiband aerial on standard substrates and ´EM Bandgap´ substrates. Simulation and design of single ultrashort power EM pulses. New methods of EM background suppression in measurement of interferences. Estimation of noise filter characteristics in conditions of non-standard impedance.

4. Advanced technologies of integrated communication systems: Optimization of access networks with up-to-date technology of data transfer in metalloid network, xDSL simulation, optimized utilization of transmission media. Optimization of equalization algorithms for ADSL and VDSL, design of computer models. Techniques for QoS support in computer network switching elements. Concept design of collective radio network integration with IP network for the distributed medium of Internet and Intranet. Design of a new protection concept for communication systems based on implementation of cryptographic mechanisms into each communication system element.

5. Special electronic circuits and operating blocks for modern communication systems: Research of new connections of analog circuits, design of a universal current and voltage conveyor, production of prototypes using the CMOS technology. Development of a new connection of universal

active filter in the KHN current mode with a pair of active CDTA elements. Research of new digital circuit structures, implementation of ultrafast digital blocks in FPGA circuits for signal preprocessing for linearization of power stages of transmitters. Design and implementation of a digital tester for monitoring the quality of optical atmospheric connection transmission. New methods of analysis and synthesis of electronic circuits, development of a new type of non-linear oscillator for chaotic signal generating. Development of a method for symbolical solution of extensive circuits, mainly in microelectronic applications.

6.Digital methods of analysis, processing and transmission of multimedia signals and images: Research of new algorithms for monitoring long-term trends in multichannel digital signals, research of a unique electrooptical system for signal acquisition and preprocessing. New methods of mono- and multimodal image acquisition, analysis and consolidation. Development of fast algorithms for image real-time deconvolution. Development of techniques and software for theoretical analysis of the effect of transmission TV channels characteristics, experimental simulation. Applied research of speech signals processing, development of methods for transformation of voice man-woman, man-child and vice versa. Modification of modern methods of noise separation from the speech signal, operating in real time.

Research plan results were published in three scientific monographs, more than 50 articles in international scientific and professional journals, 250 papers at international conferences, seminars, workshops and over 100 publications and conferences in the Czech Republic. There were 20 habilitations and dissertations and 10 engineering works. In 2005 the team received 15 proven reactions, 7 from abroad.

In connection with their research within the framework of the research plan the members of the team were involved in another five international research and development projects, more than 20 GACR projects, nearly 80 FRVS projects, seven projects of the Ministry of Industry and Trade, and nearly 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 in focused on electrochemical sources of electric energy and optimization of their utility properties, on research of transport systems based on alternative sources, research of fuel cells, litho-ion batteries and electrochemical supercapacitors. It is concerned with optimized operation of photovoltaic energy transducers, litho-ion energy transducers, small hydroelectric plants and small cogeneration units, research of power supply semiconductors converters of extreme parameters, digital control of pulse power sources, application of artificial intelligence in design optimization, identification of parameters and simulation of dynamic effects of electric machines, research of the properties of special electric machines, exploitation of low-potential sources of heat and unconventional ways of heat accumulation and electrification system optimization in conditions of permanently sustainable growth.

Involved in the research plan in 2005 were 26 members in category D1, 27 in category D2, 15 in category D3 that is 6 professors, 19 associate professors, 16 assistant professors, 2 lecturers, 6 postgraduate students and technical and administration staff of 19.

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

1. Chemical sources of electric energy : Development of programming environment of new measuring centre for fully automated operation of measurement of electrochemical sources of electric energy. Synthetization of new membrane for fuel cells on the basis of polyepichlorhydrine and DABCO (diazobicyocooctane), and research into its utilization as a membrane for oxygen-hydrogen cells. Design of the technology of preparation of macroporous electrode materials for negative electrode in lithium cells targeted at optimized efficiency of used materials. Focus on the sample chamber of the environmental scanning electron microscope (ESEM) to achieve condition near to saturated water vapours.

2. Optimization of electrochemical electric energy conversion: development of magnetic levitation system – design, construction and implementation of a levitation system of two levitation elec-

tromagnets and two control circuits for positioning at a constant length of air gap. Development of three-phase 150 kW alternator. Development of a DC high-current 3000 A source for galvanization and a coaxial 600A source with extremely low output dissipation inductance. A switch source operating at high switching frequencies. Transducer for switching reluctance motor – cooperation with Juli Motorenwerke. Transducer for low-voltage asynchronous motor. The VDT01 vibrodiagnostic device – a two-channel device for connecting two velocity or acceleration sensors. Optimized commutation of electric machines and measurement of sliding contact mechanical parameters in order to improve operating characteristics of machines.

3. Optimization of electric energy conversion and exploitation in systems with ecological power sources: Extension of the TheCoufal database system by atomic and biatomic components containing chlorine. Program for computing the composition and thermodynamic properties of gaseous systems. An introductory study on optimization of municipal DS in conditions of liberalized market with electric energy. Design of an experimental model of hydrogen accumulator as a carrier of energy converted from solar energy by means of photovoltaic conversion, using metalhydrides for hydrogen adsorption, with temperature- and pressure-controlled adsorption processes. Analysis of the measuring methods of surface recombination and passivating quality of selected layers of solar photovoltaic cells. Setup of a new measuring workplace for photovoltaic cells diagnosing, equipped with the LBIC (Light Beam Induced Current) measuring device and a device for measuring the efficiency of photovoltaic cells. LBIC (Light Beam Induced Current). A model of the characteristics of voltage transformer for simulation of transient effects in electrification systems.

4. Alternative ecological transport: A traction system with Li-ion accumulator and intelligent charger – a special traction drive was developed for single-track vehicles. Verification of operation of low-floor electric bus in city transport, in cooperation with ČAS-SERVICE a.s. Znojmo, BETA EL electric vehicles in cooperation with ŠKODA ELCAR s.r.o. Ejpovice, EPRONA s.r.o. Rokytnice nad Jizerou and ČAS-SERVICE a.s. Znojmo and the electric folding scooter in three-track version in cooperation with Griesmühle Kleinkraftwerk GmbH, Ottensheim, Austria.

Results of research conducted within the framework of the research plan were issued in 200 publications, among them two monographs, 13 articles in international and 12 in national journals. They presented 83 papers at international and 88 papers at national conferences. One member of the team was habilitated and six dissertations were completed.

The research team participated in eight GACR, nine FRVS projects, six projects of the Ministry of Industry and Trade, one Kontakt project and one project of Foundation Duhová Energie. The members of the team were also involved in the 6th Framework Programme.

Habilitations and Appointments to Professorship

In 2005 one member of FEEC staff was granted the title of professor and eleven new associate professors were appointed:

Prof. Ing. Ivo Provazník, Ph.D.
Electronics and Communications

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

Doc. Ing. Otakar Wilfert, CSc.
Electronics and Communications

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

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

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

Doc. RNDr. Milada Bartlová, Ph.D.
Theoretical Electrical Engineering

Doc. Ing. Jiří Kozumplík, CSc.
Electronics and Communications

Doc. Ing. Pavel Vorel, Ph.D.
Power Electrical and Electronic Engineering
Doc. Ing. Vít Novotný, Ph.D.
Electronics and Communications

Doc. Dr. Ing. Pavol Bauer
Power Electrical and Electronic Engineering
Doc. Ing. Václav Zeman, Ph.D.
Electronics and Communications

Postgraduate Study

In academic year 2005/06 there have been 317 students in the doctoral study programme. Among them 10 students are in the study programme in English, and one international student receives government scholarship. The numbers of postgraduate students in individual years of study over the past six years are given in Table 3.

Table 4 shows the numbers of doctoral programme graduates at individual departments over the past five years.

A list of doctoral programme graduates in 2005 can be found on FEEC websites, links *Study*, *Doctoral study programme*, *Doctoral programme graduates*.

Table 3: Numbers of postgraduate students in the period 2001 - 2005

Year	2001	2002	2003	2004	2005
1.	64	76	96	87	49
2.	45	59	70	80	71
3.	44	44	57	65	72
4.	35	41	31	48	44
5.	38	25	32	27	33
6.	22	33	31	28	24
7.	40	33	25	31	24
Total	288	311	342	366	317

Student Creativity

The STUDENT EEICT Conference and Competition was jointly organized by FEEC and FIT on 28 April 2005. The abbreviation conceals the English words Electrical Engineering, Information and Communication Technology indicating the priority areas of research and education at the two faculties.

Winners of the faculty round advanced to the international round of the competition Honeywell EMI 2005 organized with support of the company Honeywell by FEKT, FIT and Faculty of Mechanical Engineering of the Brno University of Technology. The abbreviation comes from Electrical Engineering, Mechanical Engineering and Information Technology.

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

Table 4: Doctoral programme graduates at FEEC departments in the period 2001 - 2005

	2001	2002	2003	2004	2005	Total
UAMT	5	2	4	8	3	24
UBMI	2	1	1	2	2	12
UEEN	0	1	0	6	1	10
UETE	3	3	2	0	3	12
UFYZ	0	2	0	1	1	4
UMEL	4	4	1	3	8	23
UREL	4	1	3	1	9	22
UTEE	0	0	1	1	2	5
UTKO	6	1	11	4	4	30
UVEE	3	8	6	3	4	30
Total	27	23	29	29	37	172

External Relations and International Cooperation

International Activities

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 the 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, 45 students could study abroad in the extent of 161 student/months, and 26 teachers were on lecture stays at the length of 36 weeks, which is approximately the same extent as in 2004 (see Table 5).

Reciprocally, there has been an increased interest of foreign students. Within the Socrates programmes there were 23 students coming for placements in the total extent of 84 months, which represents an increase by 68% of student/month in comparison with 2004. Mobility figures for incoming and outgoing students in for 2005 are in Table 6.

Existing agreements in the Socrates-Erasmus programme were renewed. On the whole, the faculty has concluded 40 bilateral agreements. A list of universities cooperating with FEEC on the basis of Socrates-Erasmus agreements for academic year 2005/06 is given in Table 7.

In 2005 the funds for long-term study and research stays abroad of students of all degree programmes from the Development programme of the Ministry of Education 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.

Cooperation is supported of FEEC departments and academics with institutions abroad based on interfaculty and Socrates-Erasmus agreements as well as establishing of new contacts. In 2005 the amount of 500,000 CZK was provided in support of these activities.

Another 600,000 CZK was provided in support of international activities. The trend in funding in the period of the past three years can be seen in Graph 5.

Table 5: Student and teacher placements in Socrates/Erasmus programme in the period 2002-2005

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

Table 6: Student placements at FEEC and abroad within the framework of various programmes in 2005

Activity	Incoming students		Outgoing students	
	Students	Months	Students	Months
Socrates-Erasmus	23	84	45	161
CEEPUS	1	3	-	-
Leonardo	5	17	-	-
Interfaculty agreements	2	2	-	-
Development programme of the Ministry of Education	-	-	14	42
Other mobility programmes	5	7	-	-
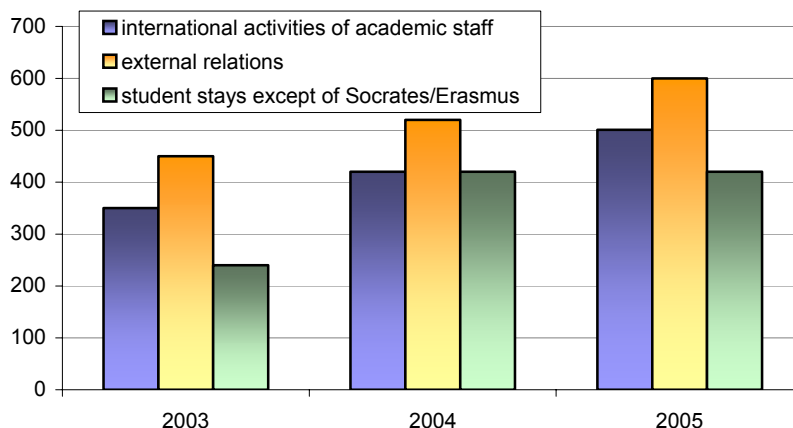
Graph 5: Funding of international activities of FEEC staff, faculty international activities and student placements outside the Socrates programme in the period 2003-2005 in thous. of CZK

External Relations

Activities were focused on presentation of FEEC by offering current and specific information to the public 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 the research and scientific potential of FEEC departments and workplaces, on habilitations and appointments to professorship, on research projects, research and development grant projects of the Grant Agency of the Czech Republic, Ministry of Industry and Trade, Ministry of Education and other projects including the 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, which was organized in Plzeň from 26 to 28 May 2005. The meeting dealt with transformation of study programmes of Czech universities based on the Bologna Decla-

ration 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 Bradley, JULI Motorenwerke, Škoda Volkswagen Mladá Boleslav, Telecom, Motorola, AMI Semiconductor, Schneider Group, Celestica, etc.

Close cooperation of many years has been maintained with the Institute of Instrumentation of the 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's and in Doctoral programmes. On the basis of an agreement between FEEC and Academy of Science Ph.D. students can be educated at Academy's institutes

Cooperation has been going on with other institutions as well. Faculty´s 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 7: Universities which concluded Socrates/Erasmus agreements for academic year 2005/06

University	Country
Katholieke Hogeschool Brugge-Oostende	Belgium
Katholieke Hogeschool Limburg	Belgium
Techničeski Universitĕt – Sofia	Bulgaria
Aalborg Universitet	Denmark
Danmarks Tekniske Universitet Lyngby	Denmark
Ingeniørhøjskolen i Århus	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 di Genova	Italy
Fachhochschule Darmstadt	Germany
Fachhochschule Furtwangen	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
Universität Siegen	Germany
Universitetet i Bergen	Norway
Wyższa Szkoła Zarządzania w Gdańsku	Portugal
Instituto Politécnico de Lisboa - ISEL	Portugal
Instituto Superior de Engenharia de Coimbra	Portugal
Žilinská univerzita	Slovakia
Universidad de Cantabria	Spain
Universidad de Zaragoza	Spain
Universitas Miguel Hernández Elche	Spain
Universitat Rovira i Virgili Tarragona	Spain
Malmö högskola	Sweden
Coventry University	Great Britain
University of Salford	Great Britain
University of Bournemouth	Great Britain
University of Huddersfield	Great Britain

Academic Senate

Until elections in October 2005 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. Ivan Rampl, CSc., chairman, LK, UTKO
Ing. Josef Bradík, PK, UVEE
RNDr. Petr Fuchs, Ph.D., EK, UMAT
Ing. Ivana Jakubová, PK, UREL
Doc. Ing. Jiří Kozumplík, CSc., chairman of EK, UBMI
RNDr. Vlasta Krupková, CSc., EK, UMAT
PhDr. Ludmila Neuwirthová, PK, UJAZ
Prof. Ing. Petr Pivoňka, CSc., LK, UAMT
Ing. Helena Polsterová, CSc., PK, UETE
Ing. Aleš Prokeš, Ph.D., LK, UREL
Doc. Ing. Petr Toman, Ph.D., chairman of LK, UEEN
RNDr. Naděžda Uhdeová, chairman of PK, UFYZ

Student Chamber
Miroslav Kuruc, chairman, EK
Bc. Soňa Brudná, PK
Jiří Gajdošík, EK
Ing. Radek Kvíčala, postgraduate students's representative, EK
Jiří Piškula, PK, LK
Petr Polách, PK, LK
Tomáš Žabka, PK

Election period ended on 31 October 2005, elections were held during the week starting from 10 October 2005. Elected members of Academic Senate are listed below:

Chair
RNDr. Vlasta Krupková, CSc., UMAT

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

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

In 2005 Academic Senate held 11 regular meetings and one irregular meeting, with average attendance of 85%. Academic Senate dealt with legislative, economic and pedagogical issues.

Proposals for Admission Procedure Regulations for all formats of study to come into effects in academic year 2006/07 were discussed.

Academic Senate discussed and approved the economic report for 2004, and proposal for distribution of financial means and allotment of education funds. Also discussed and approved was the method of funding of three research plans in category B obtained by the faculty in 2005 – establishment of a new research plan fund, acquisition and distribution of funds.

The first task of the newly elected Senate was electing a candidate for the Dean for the period 2006-2009 which was held on 13 December 2005. Professor Radimír Vrba was re-elected.

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

Completed in 2004 was construction of the joint premises of FEEC and Faculty of Management at Kolejní 4 in the area Pod Palackého vrchem. After some time of use it was found necessary to complete the system of cooling and forced air circulation in lecture and administration rooms.

The Project started in 2005 and costs were partly covered by departments.

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

Reconstructions

The 5th and 6th floors of building A3 at Technická 2 were reconstructed and the Department of Power Electrical Engineering moved in. The reconstruction was partially funded by the faculty.

The premises at Purkyňova 118 where the Department of Power Electrical Engineering used to be located will be offered to the departments of radioelectronics and telecommunications. At the end of 2005 reconstruction of rooms for the Department of Telecommunications started.

Along with reconstruction of the 5th and 6th floors of A3 repairs were carried out at the 7th floor (Department of Power Electrical and Electronic Engineering) in order to have all FEEC premises in A3 reconstructed in the same way.

Adaptations at Technická 8

The general reconstruction of roofs at Technická 8 was completed in 2005. Inside the building, painting of walls damaged by leaking water was started.

Construction Works

Preparations for construction of a new building at Technická 10 slowed down in 2005 as the consent of central authorities with the method of financing the project preparation had to be obtained. Therefore the project preparation supplier and the general supplier will be selected in 2006.

Computer Network and Information Systems

Priority was given to:

- upgrading of servers at premise Brno-centre and Brno-north,
- strengthening of the network of Gb information and communication technologies
- network backup
- processing requirements for access systems in connection with transfer to Myre chip cards and preparation of working samples for selection of implementation system
- innovation and administration of faculty websites
- building up the faculty information system over the central data store of BUT
- configuration of SW support to access system and interconnection with the regulation system of Integrated premises
- implementation of the information system SAP

Information Systems and Services

FEEC is taking part in setting up the information system of the Brno University of Technology within which the information system of FEEC was established on the principle of Internet and Intranet using the XML/XSLT technology, over the central data store of the Brno University of Technology with the Oracle technology. In addition to the module for research data processing, the module for study administration was put in operation. This module is used by the Study Department, and also by the staff (attributes of subjects, assessment) and by students (electronic enrolment, study results). The technology of the module can cope with peak overloading of the system in busy periods of academic year (the beginning and end of the semester, the examination period).

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 2005.

The Centre provides consultancy to female students, professional and personal, and organizes information events for the public aimed at removing the barriers female students face when choosing careers in technical fields. Support to 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 2005 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 to 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 activities, research and grant projects, organizing of international conferences, local seminars and lectures.

Achieved 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 each 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. The Student Union cooperates with Academic Senate of FEEC and Academic Senate of the university in handling both short-term problems as well as long-term tasks. The Student Union is a partner to the faculty leadership in an effort to maintain communication and information exchange.

Students are informed at noticeboards and at Student Union websites. Student Union takes care of questionnaires by means of which the faculty gets feedback from the students.

All FEEC students can apply for Student Union membership.

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 2005 Student Union took part in organizing welcoming information lectures for first-year students where they received ´student´ information about 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 students´ and faculty needs are discussed. On request of students, a university-wide exchange of lecture notes was organized.

Student Union has started 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.

Department of Control and Instrumentation

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Prof. Ing. František Zezulka, CSc.

Associate Professors
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Doc. Ing. Petr Beneš, Ph.D.
Doc. Ing. Jozef Honec, CSc.
Doc. Ing. Václav Jirsík, CSc.
Doc. Ing. Pavel Jura, CSc.

Lecturers
Ing. Zdeněk Bradáč, Ph.D., Ing. Miloslav Čejka, CSc., Ing. Marie Havlíková, Ing. Radovan Holek, CSc., Ing. Stanislav Klusáček, Ing. Tomáš Macho, Ph.D., Ing. Michal Polanský, Ph.D., Ing. Miloslav Richter, Ph.D., Ing. Soňa Šedivá, Ph.D.

Postgraduate Students
Ing. Petr Cach, Ing. Miloš Čábel, Ing. Luděk Černý, Ing. Jiří Dohnal, Ing. Jolana Dvorská, Ing. Petr Fiedler, Ph.D., Ing. Pavel Fojtík, Ing. Michal Gajdušek, Ing. Marie Havlíková, Ing. Zdeněk Havránek, Ing. Peter Honec, Ing. Petr Honzík, Ing. Karel Horák, Ing. Jakub Hrabec, Ing. Petr Hráček, Ing. Michal Hrouzek, Ing. Ondřej Hynčica, Ing. Ondřej Jež, Ing. Michal Jurosz, Ing. Peter Kacz, Ing. Ilona Kalová, Ing. Jiří Keprt, Ing. Stanislav Klusáček, Ing. Michal Knotek, Ing. Tomáš Kopecký, Ing. Lukáš Kopečný, Ing. Miroslav Krupa, Ing. Pavel Kříž, Ing. Ondřej Lebeda, Ing. Jaroslav Lepka, Ing. Marek Lisztwan, Ing. Vojtěch Němec, Ing. Petr Nepevný, Ing. Tomáš Neužil, Ing. Lubomír Novák, Ing. Michal Polanský, Ph.D., Ing. Michal Schmidt, Ing. Pavel Střítecký, Ing. Soběslav Valach, Ing. Jan Valenta, Ing. Markéta Vaňková, Ing. Petr Vaňous, Ing. Michal Vašina, Ing. Václav Veleba, Ing. Hynek Vychodil

Administrative and Technical Staff
Ing. Luděk Anděra, Ing. Jan Beran, František Burian, Lenka Petrová, Ing. Petr Petyovský Ing. Radek Štohl, Ph.D., Jan Vodička, Miloš Zbořil, Ing. Luděk Žalud, Ph.D.

Main Interests

The department's main areas of interest are:

Industrial automation with focus on in-built systems with direct connection to Internet and industrial Ethernet, in-built automation systems with wireless connection, and the development of virtual communications for automation within the framework of the 6th framework programme.

Implementation of heterogeneous control algorithms, real-time communication and control in the MATLAB Simulink system and programmable automatic. Control adaptable systems, their development and verification by means of methods based on artificial intelligence principles.

Development of special hardware and software for image processing and computer vision applications in industry and transport, traffic monitoring systems (average speed measurements, detection of moving vehicles when red light is on, incoming system, toll collection on highways)

Research of vibration acoustic methods of measurement of mechanical properties of materials and thermal contactless and thermal contactless defectoscopy, contactless temperature measurement and thermodiagnostics.

Research and development of wireless accelerometers. A measuring system for heterogeneous synthesis reactors.

Development of the rescue robotic system Orpheus including new laboratory – testing polygon for mobile robots. In polygon building cooperation was started with the national Institute of Standards and Technology, USA. In the development of robot communication subsystem the team cooperates with UTIA of Academy Sciences.

The department of automatic control of the Centre of Applied Cybernetics has been working on the research and development of algorithms for sensorless control of electrical drives control and identification of their parameters. Research has been carried out in cooperation with Freescale Polovodiče s.r.o.

The department cooperates with the following industrial and academic partners : Siemens, Analog Devices, Honeywell, MOTOROLA, National Institute of Standards and Technology USA, Stoeber Pforzheim SRN, TSI System Brno (Raytek GmbH Berlin), BetaControl Brno, Camea, s r. o., Centre for Machine Perception, Faculty of Electrical Engineering, Czech Technical University Prague, police of the Czech Republic, Mendelejev Forestry and Agriculture University Brno, Faculty of Mechanical Engineering, Brno University of Technology, Academy of Science of the Czech Republic, APOS TRADE s.r.o, IFM Electronic s.r.o., ATX Automation, FEI company, SVCS s.r.o.

Major Achievements

The department's staff issued a number of publications and papers, e.g. Švéda, M., Beneš, P. Vrba, R., Zezulka, F. Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems. Chapter: *Introduction to Industrial Sensor Networking.* CRC Press, Vaclavek, P., Blaha, P. Lyapunov Function Based Flux and Speed Observer for AC Induction Motor Sensorless Control and Parameters Estimation. *IEEE Transactions on Industrial Electronics,* Veleba, V., Pivoňka, P. Adaptive Controller with Identification Based on Neural Network for Systems with Rapid Sampling Rates. *WSEAS Transactions on Systems.*

The project ´The Method of Measuring the Time of Passage and the Device for Application of the Method´ was completed. Safe residential house systems based on the ZigBee wireless technology were developed. Building of the Siemens laboratory of control and communication systems was commenced at the Department of Control and Instrumentation. Development and implementation of algorithms for contactless asynchronous motor control, verification of control without using the sensor of rotations on an operating sample.

The robotic team RoBohemia ranked third at the European Robot Soccer Championships 5-11 June 2005 at the University of Twente, Enschede, Holland. The team was presented in the Dutch TV. The prototype of the exploration mobile robot Orpheus-X2 was implemented. It was presented in the Czech TV on the Day of Science Česká hlava, at the BVV International Trade fair and at RoboCup Camp 2005 in Rome.

Major Research Projects

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

The Industrial Wireless Automation Network Bluetooth – GAČR 102/03/1097
Investigator: František Zezulka

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

Development of Operation and Control Technology for Radionuclide Radiation 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

BRADÁČ, Z. Sensors with a direct connection to the Internet. *WSEAS Transactions on Systems*, ISSN 1109-2777, 2005, vol. 4, no. 1, pp. 60 - 63.

BRADÁČ, Z., FIEDLER, P., HYNČICA, O. Design of ZigBee Device. *WSEAS Transactions on Communications*, ISSN 1109-2742, 2005, vol. 5, no. 4, pp. 224 - 233.

FIEDLER, P. Formal description of Interoperability. *WSEAS Transactions on Systems*, ISSN 1109-2777, 2005, vol. 4, no. 1, pp. 64 - 67.

JIRSÍK, V., HONZÍK, P. Hybrid Expert System. *WSEAS Transactions on Information Science and Applications*, ISSN 1790-0832, 2005, no. 7, pp. 95 - 97.

PIVOŇKA, P., NEPEVNÝ, P. Generalized Predictive Control with Adaptive Model Based on Neural Networks. *WSEAS Transactions on Circuits*, ISSN 1109-2734, 2005, vol. 4, no. 4, pp. 385 - 389.

PIVOŇKA, P., SCHMIDT, M. Platform Independent Neural Semi-Inverse Controller. *WSEAS Transactions on Systems*, ISSN 1109-2777, 2005, vol. 4, no. 4, pp. 365 - 369.

PIVOŇKA, P., ŠVANCARA, K. The Use of Short Sampling Period in Adaptive Control. *WSEAS Transactions on Systems*, ISSN 1109-2777, 2005, vol. 10, no. 4, pp. 1627 - 1 636.

ŠTOHL, R., GLOVINOVÁ, E., POSPÍCHAL, J. Detection system for electro-separation analytical methods. *Journal of Separation Science*, ISSN 1615-9306, 2005, vol. 28, no. 12, pp. 1363 - 1 369.

ŠVÉDA, M., BENEŠ, P., VRBA, R., ZEZULKA, F. Handbook of Sensor Networks. Chapter: *Introduction to Industrial Sensor Networking.* 1issue New York: CRC Press, 2005. pp. 1 - 25 . ISBN 0-8943-1968-4

VELEBA, V., PIVOŇKA, P. Adaptive Controller with Identification Based on Neural Network for Systems with Rapid Sampling Rates. *WSEAS Transactions on Systems*, ISSN 1109-2777, 2005, vol. 4, no. 4, pp. 385 - 388.

VYCHODIL, H., SCHMIDT, M., NEPEVNÝ, P., PIVOŇKA, P. Generalized Predictive Control with a Nonlinear Autoregressive Model. *WSEAS Transactions on Circuits*, ISSN 1109-2734, 2005, vol. 2005, no. 3, pp. 125 - 130.

ŽALUD, L. RoboCup 2004: Robot Soccer World Cup VIII. Chapter: *Orpheus – Universal Reconnaissance Teleoperated Robot*. Germany: Springer-Verlag GmbH, 2005. pp. 491 - 498 . ISBN 3-540-25046-8

ŽALUD, L., KOPEČNÝ, L., NEUŽIL, T. 3D Proximity Scanner Integration to Rescue Robotic System. *WSEAS Transactions on Systems*, ISSN 1109-2777, 2005, vol. 2005, no. 1, pp. 43 - 48.

Bachelor's Programme

Computer Control (Petr Pivoňka)

Database Systems (Radovan Holek)

Electronic Measurement Systems (Miloslav Čejka)

Measurement of Physical Quantities (Ludvík Bejček)

Measurement in Electroengineering (Ludvík Bejček)

Microprocessors (Tomáš Macho)

Modeling and Simulation (František Šolc)

Modern Means in Automation (Václav Jirsík)

PCs in Instrumentation (Miloslav Čejka)

Practical Programming in C++ (Miloslav Richter)

Programmable Logic Controllers (František Zezulka)

Industrial Automation Means (František Zezulka)

Control Theory 1 (Petr Vavřín)

Control Theory 2 (Petr Vavřín)

Signals and Systems (Pavel Jura)

Subsystems of PCs (Jozef Honec)

Fibre Optics in Automation (Ludvík Bejček)

Computer Science in Automation (Petr Pivoňka)

Fundamentals of Robotics (František Šolc)

Master's Programme

Automation in Measurement and Experiments (Miloslav Čejka)

Means of Automation (František Zezulka)

Electronic Measuring Instruments (Miloslav Čejka)

Electronic Measuring Systems (Ludvík Bejček)

Expert Systems (Václav Jirsík)

Fuzzy Systems (Pavel Jura)

Construction of Measuring Instruments (Petr Beneš)

Laboratory Devices (Ludvík Bejček)

Logic Systems (Radovan Holek)

Measurement in Non-Electrical Quantities (Ludvík Bejček)

Microprocessors (Radovan Holek)

Operation and Systems Analysis (Petr Pivoňka)

Optimization in Controllers (Petr Pivoňka)

Optoelectronic Sensors (Ludvík Bejček)

Computers in Control (Zdeněk Bradáč)

Computer Vision (Jozef Honec)

Semiconductor and Smart Sensors (Petr Beneš)

PCs in Instrumentation (Miloslav Čejka)

Control Systems Projecting (František Zezulka)

Robotics (František Šolc)

Sensors of Non-Electrical Quantities (Ludvík Bejček)

Servomechanisms and Components of Robots (Zdeněk Malec)

Signal Processors in Automation and Measurement (Jozef Honec)

Reliability and Diagnostics (Zdeněk Malec)

Machine Learning (Václav Jirsík)

PC Subsystems (Jozef Honec)

Theory of Dynamic Systems (Petr Vavřín)

Artificial Intelligence (Václav Jirsík)

Processing of Multidimensional Signals (Jozef Honec)

Doctoral Programme

Hierarchical and Decentralized Control (František Zezulka)

Intelligent Controllers (Petr Pivoňka)

Modern Control Theory (Petr Vavřín)

Computer Vision in Technical Applications (Jozef Honec)

Reliability and Diagnostics (Zdeněk Malec)

Technical Robotics (František Šolc)

Selected Areas of Control Instrumentation (Petr Vavřín)

Selected Areas of Optoelectronics (Ludvík Bejček)

Laboratories

Laboratory of Process Automation (instruction in programmable automatics and single-chip microcontrollers, research of PLC, DCS, safety and reliability systems, Pavel Kučera)

Laboratory of Automatic Control (instruction in physical models of processes, Jakub Hrabec)

CLG Laboratory (instruction and research of physical, continuous and discrete models, design and verification of identification and control algorithms on principles of artificial intelligence, development and verification of modern, adaptive, optimal, predictive and conventional controllers, Petr Pivoňka)

Laboratory of Electrical Measurement (instruction in Electrical Measurement, Marie Havlíková)

Laboratory of Electronic Measurement (instruction in Electronic Measurement, Miloslav Čejka)

Laboratory of Measurement of Non-Electrical Quantities (instruction in Sensors and Measurement of Non-Electrical Quantities, Petr Beneš)

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

Laboratory of Temperature Measurement (instruction and research laboratory of contactless temperature measurement methods, Ludvík Bejček)

Laboratory of Microprocessors (computer room, Tomáš Macho)

Laboratory of Modern Control Methods (instruction in PLC and *microcontroller* control, industrial communication network and buses, Petr Fiedler)

Laboratory of Optoelectronics (instruction in Optoelectronics, Ludvík Bejček,)

PC Laboratory 1 (computer room, Zdeněk Bradáč)

PC Laboratory 2 (computer room, Václav Jirsík)

Laboratory of Computer Vision (research of computer vision, industrial and traffic applications, Ilona Kalová)

Laboratory of Computer Vision Focused on Transport Applications (research of computer processing of traffic situations, detection of vehicles, Petr Honec)

Laboratory of Programmable Automatics (instruction in PLC and Industrial Control Systems, Radek Štohl)

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

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

Laboratory of Reliability (instruction in Reliability and Diagnostics, Zdeněk Malec)

Laboratory of PC Subsystems (research, development and testing of signal processors peripheries, DSP ,CPLD and FPGA gate fields, Soběslav Valach)

Laboratory of Telepresence (research and development of remote controlled robots, Tomáš Neužil)

Laboratory of Vibrodiagnostics (research and development of the methods of vibrodiagnostics, calibration of acoustic emission sensors, acoustic emission applications for non-electrical quantities measurement and vibration diagnostics methods, Petr Beneš)

Testing Polygon (research and development of mobile robots, Luděk Žalud)

Department of Biomedical Engineering

Prof. Ing. Jiří Jan, CSc.
Head

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

Associate Professors
Doc. Ing. Aleš Drastich, CSc.
Doc. MUDr. Václav Chaloupka, CSc.
Doc. Ing. Milan Chmelař, CSc.
Doc. Ing. Jiří Kozumplík, CSc.
Doc. Ing. Jiří Rozman, CSc.
Doc. RNDr. Ing. Jiří Šimurda, CSc.

Lecturers
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., Ing. Roman Žák

Postgraduate Students
Ing. Asterios Anagnostoudis, Ing. Milan Blaha, Ing. Radovan Burhan, Ing. David Čermák, Ing. Tomáš Červinka, Ing. Martin Čížek, Ing. Petr Dub, Ing. Adam Filipík, Ing. Martin Hlaváč, Ing. Ferdinand Hodáň, Ing. Marek Humhal, Ing. Lukáš Chmelka, Ing. Josef Jaroš, Ing. Dina Kičmerová, Ing. Libor Kubečka, Ing. Radomír Kurečka, Ing. Pavel Leinveber, Ing. Vladimír Mahdal, Ing. Michal Mikl, Ing. Jan Musil, Ing. Radim Petržela, Ing. Martin Plchút, Ing. Václav Prajzner, Ing. Jaroslav Rohel, Ing. Ivo Říha, Ing. Petr Sadovský, Ing. Daniel Schwarz, Ing. Martin Skokan, Ing. Viktor Svoboda, Ing. Milan Tannenberg, Ing. Petr Verner, Ing. Zbyněk Veselý, Ing. Roman Vopálka, Ing. Marek Vyklický, Ing. Jiří Začal, Ing. Miloslav Zadražil, Ing. Michal Závišek, Ing. Roman Žák

Administrative and Technical Staff
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's and Master's 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 the records of electric 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 of Brno, the Faculty Hospital in Brno-Bohunice, and other institutions.

Research focused on the methods of reconstruction of 2D and 3D ultrasonographic tomography and ophtalmological images, analysis of cardiological ultrasonographic 3D data and reconstruction of ultrasonographic images, and the development of a unique device for simultaneous optical and electrical recording of heart activity for detection of by-effects of drugs and analysis of results. The department´ laboratories will be upgraded with support from grants, and will also be partially used for instruction, mainly of talented students.

The department concentrates on the development of the new Master's programme in the study area Biomedical and Ecological Engineering, and on completion of instruction laboratory of multimedia signals and images.

Major Achievements

The members of the department's staff were involved in several research projects the results of which were published in scientific journals and at prestigious international conferences, and also in an international monograph.

A division of the National Research Centre DAR (Academy of Sciences, Prague) was set up at the department on the basis of the results of a public competition focused on analysis and consolidation of images.

Associate Professor Ivo Provazník, Vice-Dean of FEEC, was appointed professor, which substantially lowered the average age of professors and associate professors at the department. Jiří Kozumplík, assistant professor and secretary of the department was habilitated, and young perspective teachers, the former postgraduate students at the department, joined the staff.

Tuition was started in the Master's programme in the study area Biomedical and Ecological Engineering. The number of students interested in the programme was relatively large – 40 students enrolled in the Master's programme.

The year 2005 was a gap year between the conferences BIOSIGNAL 2004 and 2006 regularly organized under the auspices of the European Association EURASIP and the world organization IEEE. In 2005, the department paid attention to preparation of the conference (setting of international programme committee chaired by Professor Jan and organizing committee chaired by Professor Provazník). The conference has been for many years recognized as a reputed event among the international community in our field of science, which is a significant achievement.

The department was invited to participate in the prepared European project EVICAB (European virtual campus for e-learning in biomedical engineering), which was given a European Commission grant. In the period 2006-2007, the department will be taking part in this important project.

The senior member of the department, associate professor Milan Chmelař, was appointed vice-chairman of the committee for awarding gold medals at the HospiMedica trade fair.

Major Research Projects

Deconvolution of Ultrasound Images – MŠMT 1K03017
Investigator: Jiří Jan

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

High Resolution Optical Recording of Action Potentials for an Analysis of ECG Signal T-Wave Alternans- GAČR 102/04/0472
Investigator: Ivo Provazník

An Optical System for Measurement of the Position and Orientation of the Ultrasound Probe for 3D Imaging in Cardiology – GAČR 102/03/D030
Investigator: Zoltán Szabó

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

Design of Algorithms for Reconstruction of High-Resolution Images in Ultrasound Tomography - D-CZ22/05-06
Investigator: Radovan Jiřík

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

Processing and Analysis of 3D Ophtalmological Image Data Focused on the Enhancement of Prevention Glaucoma Diagnostics – GAČR 102/03/P153
Investigator: Radim Kolář

Selected Publications

BÉBAROVÁ, M., MATĚJOVIČ, P., PÁSEK, M., ŠIMURDOVÁ, M., ŠIMURDA, J. Effect of ajmaline on transient outward current Ito in rat ventricular myocytes. *General Physiology and Biophysics*, ISSN 0231-5882, 2005, vol. 24, no. 1, pp. 27 - 45.

BÉBAROVÁ, M., MATĚJOVIČ, P., PÁSEK, M., ŠIMURDOVÁ, M., ŠIMURDA, J. Effect of ajmaline on action potential and ionic currents in rat ventricular myocytes. *General Physiology and Biophysics*, ISSN 0231-5882, 2005, vol. 24, no. 3, pp. 311 - 324.

CHALOUPKA, V., ELBL, L., TOMÁŠKOVÁ, I. Exercise Intensity Prescription After Myocardial Infarction in Patients Treated With Beta-blockers. *Journal of Cardiopulmonary Rehabilitation*, ISSN 0883-9212, 2005, vol. 2005, no. 25, pp. 361 - 365.

CHRÁSTEK, R., KUBEČKA, L., JAN, J. Towards automated diagnostic evaluation of retina images. *Pattern Recognition and Image Analysis*, ISSN 1054-6618, 2005, vol. 15, no. 2, pp. 273 - 276.

CHRISTÉ, G., PÁSEK, M., ŠIMURDA, J. Modelling changes of [Ca2+] and [K+] in the T-tubules of rat and guinea pig ventricular myocytes. *Journal of Physiology*, ISSN 0022-3751, 2005, vol. 561P, pp. PC6

CHRISTÉ, G., ŠIMURDA, J., ORCHARD, C., PÁSEK, M. Cycling of cations between T-tubular and surface membranes in a model of guinea-pig ventricular cardiomyocytes. *Journal of Molecular and Cellular Cardiology*, ISSN 0022-2828, 2005, vol. 39, no. 1, pp. 174

JAN, J. Medical Image Processing, Reconstruction and Restoration - Concepts and Methods. 1. ed. Boca Raton, FL, USA: CRC Press, Taylor and Francis Group, 2005. pp. 1 - 760 . ISBN 0-8247-5849-8

LÁBROVÁ, R., HONZÍKOVÁ, N., MADĚROVÁ, E., VYSOČANOVÁ, P., NOVÁKOVÁ, Z., ZÁVODNÁ, E., FIŠER, B., SEMRÁD, B. Age-dependent relationship between the carotid intima-media thickness,

baroreflex sensitivity, and the inter-beat interval in normotensive and hypertensive subjects. *Physiological Research*, ISSN 0862-8408, 2005, vol. 54, no. 4, pp. 593 - 600.

PÁSEK, M., ŠIMURDA, J., ORCHARD, C., CHRISTÉ, G. Quantitative exploration of T-tubular membrane parameters in a model of rat ventricular myocyte. *Journal of Molecular and Cellular Cardiology*, ISSN 0022-2828, 2005, vol. vol.39, no. 1, pp. 177 – 178.

ŠIMURDA, J., PÁSEK, M., CHRISTÉ, G., ŠIMURDOVÁ, M. Modelling the distribution of [Ca2+]within the cardiac T-tubule - Effect of Ca2+ current distribution and changes in extracellular [Ca2+]. *Journal of Physiology*, ISSN 0022-3751, 2005, vol. 561P, no. 1, pp. PC5.

Bachelor's Programme

Human Biology (Nataša Honzíková)

Digital Signal Processing and Analysis (Jiří Jan)

Ecology in Electrotechnical Profession (Jiří Rozman)

Medical Diagnostic Devices (Radim Kolář)

Multimedia Signals and Data (Jiří Jan)

Computers and Programming 1 (Ivo Provazník)

Therapeutic and Prothetic Instruments (Jiří Rozman)

Introduction to Medical Informatics (Ivo Provazník)

Master's Programme

Adaptive Signal Processing (Ivo Provazník)

Analysis of Signals and Images (Jiří Jan)

Biophysics (Jiří Šimurda)

Human Biology (Nataša Honzíková)

Bionics (Jiří Kozumplík)

Diagnostics of Bio- and Ecosystems (Milan Chmelař)

Environmental Diagnostics (Jiří Rozman)

Ecological Engineering (Jiří Rozman)

Expert Systems and Medical Diagnostics Support (Ivo Provazník)

Conventional Imaging Systems in Medicine and Ecology (Aleš Drastich)

Clinical Physiology (Václav Chaloupka)

Medical Laboratory Devices (Milan Chmelař)

Medical Diagnostic Devices (Milan Chmelař)

Medical Information Systems (Ivo Provazník)

Modeling of Biological Systems (Radovan Jiřík)

Non-television Imaging Systems (Aleš Drastich)

New Signal Processing Algorithms (Jiří Kozumplík)

Design of Medical Systems (Karel Jehlička)

Therapeutic Instruments (Jiří Rozman)

Introduction into Environmental Research (Hana Librová)

Advanced Methods of Digital Signal Processing (Jiří Jan)

Healthcare (Jindřich Vomela)

Medical Imaging Systems (Aleš Drastich)

Doctoral Programme

Bioinformatics (Ivo Provazník)

Data in Image Systems (Jiří Jan)

Methods and Systems Used in Ultrasound Diagnostics (Jiří Rozman)

Neural Networks, Adaptive and Optimum Filtering (Jiří Jan)

Spectral Analysis of Digital Signals (Jiří Kozumplík)

Advanced Methods of Digital Image Processing (Jiří Jan)

Laboratories

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

Laboratory of Image Data Analysis (a division of the Centre DAR, research in digital processing and analysis of image data, digitization and archiving of static images and videosequences, Radovan Jiřík)

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

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

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

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 for research and student projects, Radim Kolář)

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

Laboratory of Ultrasonography (measurement of ultrasonographic image data, calibration of instrumentation and ultrasound probes, Radim Kolář)

Laboratory of Digital Signal and Image Processing (instruction in Digital Signal Processing and Analysis, Multimedia Signals and Data, Signal and Image Analysis, Advanced Methods of Signal Processing, Multicycle Systems, Computers and Programming 1, Computers and Programming 2, Petr Fedra)

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

Department of Electrical Power Engineering

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

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Associate Professors

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

Lecturers

Ing. Petr Baxant, Ph.D., Ing. Michal Chmela, Ph.D., Ing. Jaroslava Orságová, Ph.D.

Postgraduate Students

Ing. Ivo Běhunek, Ph.D., Ing. Michal Bernard, Ing. René Borek, Ing. Petr Čambala, Ing. Martin Čelko, Ing. Jiří Drápela, Ing. Daniel Foltýn, Ing. René Kameník, Ing. Milan Krátký, Ing. Ilona Lázničková, Ing. Jan Macháček, Ing. Jiří Malý, Ing. Petr Mastný, Ing. Zdeněk Matoušek, Ing. Tomáš Mendl, Ing. Alexej Nováček, Ing. Martin Paar, Ing. Lukáš Potáček, Ing. Zdeněk Procházka, Ing. Václav Prokop, Ing. Petr Stojan, Ing. Jiří Uher, Ing. Libor Weidinger, Ing. Michal Závodný

Administrative and Technical Staff

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

Main Interests

Continuity of the Bachelor's study programme Power Electrical and Electronic Engineering (B-SEE) was maintained, and the new Master's degree programme Power Electrical Engineering (M-EEN) was launched.

The department participated in the research plan Resources, Accumulation and Optimization of Electric Energy Exploitation in Conditions of Permanently Sustainable Growth´ (investigator Professor Jiří Kazelle) focused on optimization of electrical energy exploitation in ecological power systems. Negotiations were commenced with the University of Liège, Belgium on exploitation of high-temperature fuel cells in heating. Research was also concerned with reducing losses in distribution and transmission networks, with localization of defects in networks, modelling the parameters of system transformers accompanying transient effects due to operation of appli-ances , the quality of electrical energy in supply mains, on exploitation of the hydrogen accumulator cycle in solar systems, optimization of loading small variable output power sources, using the Stirling thermodynamic cycle for efficient exploitation of low-potential heat, optimization of the structure of sources for system services in the conditions of liberalized market with electric energy, setting limits in inter-state energy exchange, analysis of major system failures and measures to be taken to avoid them, analysis of connection of wind-powered stations into the electrification system and implementation of an expert system for lighting space in special conditions of vision.

Cooperation with the departments of power engineering of all Czech and Slovak technical universities focused on instruction and research continued.

Major Achievements

In 2005 the department worked on two GACR, and one GAAV projects. Research results were presented at national and international conferences and in reputed scientific journals.

Cooperation with the Institute of Plasma Physics of Academy of Science continued in the Joint plasma laboratory in joint experimental research of a unique modular gaseous plasmatron designed at the Department of Power Engineering. Also continued cooperation with EGU Brno in connecting wind-powered stations and windpowered farms into electrification system.

The department moved to new premises at Technická 8. Two laboratories were upgraded in cooperation with CEZ, and a new computer room was built. In cooperation with E.ON, a static supply room for the department's laboratories was built. The department was involved in two FRVS projects concerned with innovation of instruction in Ecology in Power Engineering and Non-conventional Methods of Energy Conversions. One dissertation was successfully defended.

The design of lighting in the tunnel under the street Hlinky was implemented as well as a series of measurements of the quality of electric energy. Verification of parameters of the mathematical model of the characteristics of voltage transformers for simulation of transient phenomena in the electrification system, and work was commenced on the mathematical model of a current transformer.

Major Research Projects

New Ways of Location of Ground Connections in HV Electric Networks – AVČR KJ B2813304
Investigator: Petr Toman

Implementation of an Expert System for Illumination of High Eye-Strain Space – GAČR 102/03/1162
Investigator: Petr Baxant

Physical, Technical and Technological Limits in Electric Energy Transport in Interconnected Electrification Systems – GAČR 102/03/P033
Investigator: Petr Toman

Selected Publications

COUFAL, O., SEZEMSKÝ, P., ŽIVNÝ, O. Database system of thermodynamic properties of individual substances at high temperatures. *Journal of Physics D: Applied Physics*, ISSN 0022-3727, 2005, vol. 38(2005), no. 8, pp. 1265 - 1 274.

GREGOR, J., JAKUBOVÁ, I., ŠENK, J., HRABOVSKÝ, M. Distribution of mass fractions in the free jet of hot gas mixture. *High Temperature Material Processes: An International Journal*, ISSN 1093-3611, 2005, vol. 9, no. 1, pp. 37 - 43. IF 0,194

KAVKA, T., GREGOR, J., CHUMAK, O., KOPECKÝ, V., HRABOVSKÝ, M. Enthalpy probe study of the expanding thermal plasma jet. *High Temperature Material Processes: An International Journal*, ISSN 1093-3611, 2005, vol. 9, no. 1, pp. 45 - 53. IF 0,194

TOMAN, P., ORSÁGOVÁ, J. Earth Fault Location in MV Networks. *Iranian Journal of Electrical and Computer Engineering*, ISSN 1682-0053, 2005, vol. 2005, no. In print pp. 1 - 9.

Bachelor's Programme

Electrical Power Distribution (Vladimír Blažek)

Environmental Science in Electroenergetics (Antonín Matoušek)

Economy and Control (Michal Chmela)

Protection of Electrical Power Equipment (Petr Toman)

Computer Modeling and Simulations (Petr Baxant)

Design in Power Electrical Systems (Petr Toman)

Distribution Equipment (Jaroslava Orságová)

Machinery of Power Plants (Jiří Raček)

Technical Mechanics (Jiří Raček)

Electrical Energy Exploitation (Petr Baxant)

Electrical Power Generation (Antonín Matoušek)

High Voltage and Electric Apparatus (Vladimír Blažek)

Master's Programme

Power Plant Automation (Michal Chmela)

Economy of Power Engineering (Michal Chmela)

Economics of Electric Energy Production and Operation *SE* (Michal Chmela)

Electrical Power Plants 1 (Antonín Matoušek)

Electrical Power Plants 2 (Antonín Matoušek)

Power and Heating Plants (Antonín Matoušek)

Electric Stations and Lines (Jaroslava Orságová)

Electric Heat and Light (Petr Baxant)

Power Engineering in Ecology (Antonín Matoušek)

Power and Heating Technology (Petr Baxant)

Power Systems (Jiří Raček)

Nuclear Power Plant Operation (Jiří Raček)

Electric Energy Quality EMC 1 (Antonín Matoušek)

Small Sources of Electric Energy (Petr Toman)

Municipal and Industrial Networks (Jaroslava Orságová)

Non-Conventional Conversions (Antonín Matoušek)

Protection and Automatics (Evžen Haluzík)

Lightings Systems (Petr Baxant)

Power Engineering Projects 1 (Petr Toman)

Operation of Lighting Systems (Petr Baxant)

Transient Phenomena (Michal Chmela)

Transmission Networks (Vladimír Blažek)

Operation of Electrification Systems (Evžen Haluzík)

Fittings of Light (Petr Baxant)

Energy use (Petr Baxant)

Doctoral Programme

Application of Selected Mathematical Methods in The Power Engineering (Vladimír Blažek)

State Estimation of Power Systems Security (Evžen Haluzík)

Computer Modeling of Power Systems (Evžen Haluzík)

Low-Temperature Plasma in Power Engineering (Oldřich Coufal)

Power Plants Control (Antonín Matoušek)

Specific Problems of Power Plants (Antonín Matoušek)

Light and Lighting Systems (Petr Baxant)

Thermodynamics of The Electric Arc Plasma (Oldřich Coufal)

Solar Energy Utilization (Jan Gregor)

Laboratories

Power Plant laboratory (instruction in Systems Protection, Information and Control systems in Electrical Power Engineering, Integrated Protection Systems, measurements in real network and research work, Jaroslava Orságová)

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

Laboratory of Appliances-Electric Network Compatibility (setting characteristics of the impact of appliances on the distribution network given different conditions of the network, Jiří Drápela)

Laboratory of the Quality of Electric Power and Electromagnetic Compatibility (instruction in Quality of Electric Power and 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 works and dissertations, research into fuel cells, Petr Mastný)

Lighting Technology Laboratory (instruction in Lighting Systems, Operation of Lighting Systems, research in this study area, Petr Bažant)

Laboratory of Heating Technology (instruction in Electric Power Exploitation and Power 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 into small sources, Jaroslava Orságová,)

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

Department of Electrotechnology

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Associate Professors

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Doc. Ing. Karel Liedermann, CSc.
Doc. Ing. Marie Sedlaříková, CSc.

Lecturers

Ing. Petr Bača, Ph.D., Ing. Svatopluk Havlíček, CSc., Ing. Petr Křivák, Ph.D., Ing. Jiří Maxa, Ph.D., Ing. Helena Polsterová, CSc., Ing. Zdenka Rozsívalová, Ing. Jiří Špinka, Ing. Jiří Vaněk, Ph.D.

Postgraduate Students

Ing. Peter Barath, Ing. Patrik Bocek, Ing. Pavel Černoch, Ing. Martin Dočkal, Ing. Radek Drnovský, Ing. Martin Frk, Ing. Miroslav Haman, Ing. Roman Kameník, Ing. Martin Kocian, Ing. Ondřej Krejza, Ing. Jan Linhart, Ing. Michal Macalík, Ing. Jaromír Makovička, Ing. Jan Mertl, Ing. Pavel Nečesal, Ing. Vilém Neděla, Ing. Tomáš Nováček, Ing. Jan Rychnovský, Ing. Mgr. Luděk Schneider, Ing. Jaroslav Skřivánek, Ing. Jiří Starý, Ph.D., Ing. Tomáš Stranyánek, Ing. Marek Tretera, Ing. Petr Wandrol

Administrative and Technical Staff

Jarmila Bartošková, Ing. Zdeněk Buřival, CSc., doc. RNDr. Milan Calábek, CSc., doc. RNDr. Miroslav Cenek, CSc., Ing. Petr Kahle, František Kořínek, Rudolf Krásenský, Ing. Vítězslav Novák, Ph.D., Dagmar Prosová, Ph.D., doc. Ing. Jiří Vondrák, DrSc., Martin Zatloukal

Main Interests

In 2005 the department provided tuition in the subject Materials and Technical Documentation in the first year of the Bachelor's degree programme. On the basis of previous experience ,computer exercises in drawing electrotechnical diagrams were innovated and expanded. The department provided tuition in manufacturing processes, electrotechnical materials, printed circuits technology and surface mounting, diagnostics, testing and reliability of electrotechnical materials and manufacturing, quality assurance, design systems in both Bachelor's and Master's degree programmes. Instruction was started in the specialization ´Microelectronics and Technology´ for the 2nd year of part-time Bachelor's, Master's and follow-up Master's programme in the study area ´Electrotechnical Manufacturing and Management´. Some subjects will be offered to students in the study area ´Microelectronics´.

Research was focused on basic and applied research of renewable electrical power sources and their exploitation in alternative transport by electric and hybrid vehicles, detection of signal electrons and methods of environmental scanning microscopy, gel electrolytes and their appli-cation in lithium-ion batteries, electrocatalysts for fuel cells and thin-film electrodes for electrochromic systems, lead-free soldering and evaluation of the quality and reliability of soldered connections and diagnostics of electrotechnical materials.

The department cooperated with a number of national and international institutions - Technische Universität Wien, Universität Ulm - Zentrum für Sonnenenergie und Wasserstoff-Forschung, École Polytechnique de Montréal, Nanolytics in Feldkirchen, Institute of Instrumentation Technology, Institute of Inorganic Chemistry and Institute of Physical Chemistry of Academy of Science of the Czech Republic, companies Biochemie Bohumín, CINK vodní elektrárny (hydroelectric plants) Karlovy Vary, ČAS-Service Znojmo, EPRONA a.s. Rokytnice n. Jizerou, ROTOKOV Křídlůvky u Znojma. Within the framework of the programme KONTAKT the department cooperated with LEPMI (Laboratoire d´Electrochimie et de Physicochimie des Matériaux et des Interfaces) CNRS Grenoble, France and CLAIO (Centrale laboratorium akumulatorow i ogniw) Poznaň, Poland.

Major Achievements

In 2005 the department hosted the international conference „6th International Conference Advanced Batteries and Accumulators" (A. B. A. - 6) Brno, 5-6 June 2005 (Marie Sedlaříková, Professor Jiří Vondrák).

The department co-organized, with the Czech Electrotechnical Society (Milan Calábek) the 26th conference ´Non-Conventional sources of Electric Energy´ , Buchlovice, 5-6 October.

The department also hosted the meeting of institutes and departments of electrical engineering of Czech and Slovak technical universities as an international seminar ´Research in the Field of Electrical Engineering at the Turn of 21 Century´, 12-14 September 2005 (Josef Jirák).

A team of researchers led by Josef Jirák applied for patenting, together with the Institute of Instrumentation, Academy of Science Brno, the PV 2005-726 ´Secondary Electrons Detector´ focusing on detection of secondary electrons at higher pressures (up to 1000 Pa) in the specimen chamber of the scintillation scanning electron microscope. The pressure-limiting shielding of the detector vacuum system are used as an electrostatic lens, which together with other electrodes of suitable voltages transmits secondary electrons from the specimen chamber to the scintillator.

Under the leadership of Professor Jiří Kazelle, in cooperation with the departments of power electrical engineering, electrical and electronic engineering, microelectronics, theoretical and experimental electrical engineering, a new research plan ´Resources, Accumulation and Optimization of Electrical Energy Exploitation in Conditions of Permanently Sustainable Growth´ was started The department was involved in two GACR, two GAAV and six FRVS projects, and one project of the Ministry of the Environment.

An up-to-date integrated computer room was set up at the department in the framework of a FRVS project, equipped with the latest hardware and

software and multimedia aids. The room is used for instruction in subjects focused on design systems of printed circuit boards, CAD and CAE applications, electrotechnical manufacturing reliability, quality assurance, logistics and computer controlled manufacturing processes (Petr Bača).

Major Research Projects

Complex Study of the Internal Resistance of Lead Accumulator in Situ – AVČR B 2813305
Investigator: Petr Křivák

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

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

Composite Electrode Materials Deposited on Ion Exchanging Membranes – AVČR KJB 4813302
Investigator: Vítězslav Novák

Research of Detection Systems Secondary Electrons Detection Systems 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

CHOBOLA, Z., JURÁNKOVÁ, V., VANĚK, J. Noise spectroscopy measurement of 2.3 micron CW GaSb based laser diodes. *Elektronika*, ISSN 0033-2089, 2005, vol. 2005, no. 1, pp. 70 - 72.

VANĚK, J., CHOBOLA, Z., BRZOKOUPIL, V., KAZELLE, J. Low-frequency noise measurements used for semiconductor light active devices. *Proceedings of SPIE*, ISSN 0277-786X, 2005, vol. 2005, no. 5844, pp. 86 - 93.

VONDRÁK, J., KLÁPŠTĚ, B., VELICKÁ, J., SEDLAŘÍKOVÁ, M., NOVÁK, V., REITER, J. Carbon/manganese oxide based fuel cell electrocatalyst using "Flywheel" principle. *Journal of New Materials for Electrochemical Systems*, ISSN 14802422, 2005, vol. 8, no. 1, pp. 1 - 4.

VONDRÁK, J., REITER, J., SEDLAŘÍKOVÁ, M. Ion-conductive polymethylmethacrylate gel electrolytes for lithium batteries. *Journal of Power Sources*, ISSN 0378-7753, 2005, vol. 146, no. 1-2, pp. 436 - 440.

VONDRÁK, J., SEDLAŘÍKOVÁ, M., REITER, J. Electrochemical Activity of Manganese Oxide/Carbon Based Electrocatalysts - Comparison With Platinum/Carbon Catalyst. *Journal of New Materials for Electrochemical Systems*, ISSN 14802422, 2005, vol. 2005, no. 8, pp. 209 - 212.

Bachelor's Programme

Diagnostics and Testing (Josef Jirák)

Electrotechnical Materials and Production Processes (Jiří Kazelle)

Materials and Technical Documentation (Josef Jirák)

Design and Technology of Electric Devices (Vítězslav Novák)

Design Systems of Printed Circuit Boards (Petr Bača)

Printed Circuits and Surface Mount (Jiří Starý)

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

Quality Management and Checking (Helena Polsterová)

Quality Management and Metrology (Helena Polsterová)

Special Diagnostics (Josef Jirák)

Reliability in Electrical Engineering (Helena Polsterová)

Master's Programme

Cad 1 (Pavel Procházka)

Cad 2 (Jiří Maxa)

Cadds5 Manufacturing (Jiří Maxa)

Cadds5 Advanced Modeling (Jiří Maxa)

Cadds5 Basic of 3D Modeling (Jiří Maxa)

Design View (Jiří Maxa)

Diagnostics and Testing in Electrical Engineering (Josef Jirák)

Ecology in Manufacturing (Miroslav Cenek)

Graphic Systems 2 (Pavel Procházka)

Climatotechnology in Electrical Engineering(Karel Liedermann)

Materials for Biomedical Applications (Marie Sedlaříková)

Mechanical Desktop (Jiří Maxa)

Mount and Interconnecting Technology (Jiří Starý)

Printed Circuits and Surface Mount Technology (Jiří Starý)

Computer Design Systems (Jiří Maxa)

Design of Production Systems and Logistic (Jiří Špinka)

Data Control and Management (Jiří Maxa)

Reliability of Power Devices and Systems (Helena Polsterová)

Structure and Properties of Materials (Josef Jirák)

Diagram Design Systems (Vítězslav Novák)

3D Modeling and Simulations (Jiří Maxa)

Manufacturing of Power Devices (František Veselka)

Manufacturing Process (Jiří Kazelle)

Fundamentals of Reliability in Electrical Engineering (Helena Polsterová)

Doctoral Programme

Accumulators and Protection of Environment (Miroslav Cenek)

Diagnostics of Semiconductor Materials and Structures (Josef Jirák)

Electron Spectroscopy (Luděk Frank)

Chemical Sources of Electric Energy in Electrotechnical Practice (Milan Calábek)

Methods of Measurement in Electrochemical Power Sources (Jiří Vondrák)

Optoelectronics - Materials and Technology (Rudolf Autrata)

Laboratories

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

Air-Conditioned Laboratory of Dielectric Materials with Highly Specialized Environment (research of dielectric properties of electroinsulating materials, measurements at stabilized temperatures and relative air moisture, Svatopluk Havlíček)

Laboratory of Dielectric Materials (research, instruction and diploma theses in the field of dielectric properties of electroinsulating materials, Svatopluk Havlíček)

Electron Microscopy Laboratory (laboratory exercises in Diagnostics and Testing in Electrical Engineering, research of signal detection in environmental scanning electron microscopy, of the structure of accumulator mass and surfaces of electrotechnical materials, namely insulators, Josef Jirák)

Laboratory of Electrotechnical Materials I (laboratory exercises 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, Zdenka Rozsívalová)

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

Laboratory of Chemical Power Sources (research of lead accumulators, Milan Calábek)

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

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

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

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

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

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

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

Computer Laboratory (2) (instruction on subjects focused on reliability in electrical engineering, computer-aided design 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. Karel Liedermann, CSc.
Doc. RNDr. Marian Štrunc, CSc.

Lecturers
Ing. Jitka Brüstlová, CSc., RNDr. Pavel Dobis, CSc., RNDr. Eva Hradilová, Ing. Pavel Koktavý, CSc., 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, 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, Ing. Rostislav Stráník, Ing. Jiří Zajaček

Administrative and Technical Staff
Lenka Horká, Miroslav Sadovský, Ing. Petr Sadovský, Ing. Alena Václavíková, Ing. Vít Vrba

Main Interests

In 2005 the department provided tuition in basic courses of the Bachelor's programme Physics 1, Physics 2 and Physics for Information Technology as well as the course Physics III for the ending Master's programme as four subjects in the Doctoral degree programme.

The department was involved in basic and particularly applied research of the physical parameters of materials and semiconductors and dielectric materials. The main areas of interest were noise spectroscopy, measurement of non-linearities and design of quality and reliability indicators for assessment of the particular technological stages in mass production. Other areas of interest were local spectroscopy, topography, photoluminescence of semiconductor surfaces and dielectric relaxation spectroscopy. The department cooperated with major European and Japanese laboratories of noise spectroscopy and nanooptics.

Emphasis was laid in 2005 on updating the tasks for Physical Practice and on multimedia study materials for instruction in computer rooms and self-study.

Major Achievements

The department was involved in three GACR, two FRVS, one KONTAKT and one INGO grant. The GACR projects are concerned with solid materials non-linear defectoscopy, irreversible processes in dielectrics and processes affecting energy transport in arc discharge with liquid stabilization.

The international KONTAKT projects, where Prof. J. Šikula and Prof. P. Tománek are chief investigators, are focused on research of noise in HEMT components for global communication .Cooperation was established with MEISEI university in Tokyo and Osaka where we can use unique technological facilities for experiments. Dr. Jan Pavelka was on a study stay at MEISEI university in Tokyo.

A majority of the academic staff of the department participated in the research plan MS 2600022 – MIKROSYN, where Lubomír Grmela, is the co-investigator.

The department hosted, under the auspices of SEFI, a prestigious conference on physical education ´Physics Teaching in Engineering Education PTEE 2000´, 29 June – 1 July. The conference with 120 participants from 22 European countries and 5 countries outside Europe was presided by Lubomír Grmela, the steering committee was chaired by Jitka Brustlová.

Lecture notes Physical Practice, Uhdeová et al were issued.

Major Research Projects

Detection of Fissures in Solids by Electromagnetic Emission – GACR 102/02/D073
Investigator: Pavel Koktavý

Irreversible Processes in Electroinsulating Materials for High Temperatures – GACR 102/03/0621
Investigator: Pavel Koktavý

Non-Linear Ultrasonic Defectoscopy of Solids – GACR 205/03/0071
Investigator: Josef Šikula

Selected Publications

JENIŠTA, J., BARTLOVÁ, M., AUBRECHT, V. Radiation in water-vortex stabilized electric arc – comparison among different models. *High Temperature Material Processes: An International Journal*, ISSN 1093-3611, 2005, vol. 8, no. 2, pp. 195 - 205.

PAVELKA, J., TANUMA, N., TACANO, M., ŠIKULA, J. Low frequency noise and trap spectroscopy of InGaAs/InAlAs heterostructures. *Research Bulletin of Meisei University – Physical Sciences and Engineering*, ISSN 1346-7239, 2005, vol. 41, no. 1, pp. 147 - 154.

SEDLÁKOVÁ, V., ŠIKULA, J. Charge Carrier Transport in Polymer-Based Thick Resistive Films. *Capacitor and Resistor Technology*, ISSN 0887-7491, 2005, vol. 2005, no. 10, pp. 93 - 98.

ŠIKULA, J., HLÁVKA, J., SEDLÁKOVÁ, V., HOSCHL, P., GRILL, R., SITA, Z., ZEDNÍČEK, T., TACANO, M. Niobium Oxide and Tantalum Capacitors: M-I-S Model Parameters Comparison. *Capacitor and Resistor Technology*, ISSN 0887-7491, 2005, vol. 2005, no. 3, pp. 244 - 248.

ŠIKULA, J., SEDLÁKOVÁ, V., HLÁVKA, J., HOSCHL, P., SITA, Z., ZEDNÍČEK, T., TACANO, M., HASHIGUCHI, S. Transport and Noise Characteristics of Niobium Oxide and Tantalum Capacitors. *Capacitor and Resistor Technology*, ISSN 0887-7491, 2005, vol. 2005, no. 10, pp. 210 - 215.

TANUMA, N., TACANO, M., PAVELKA, J., HASHIGUCHI, S., ŠIKULA, J., MATSUI, T. Hooge noise parameter of epitaxial n-GaN on sapphire. *Solid State Electronics*, ISSN 0038-1101, 2005, vol. 49, no. 6, pp. 865 - 870.

TOMÁNEK, P. Photonics Prague a success. *Opto & Laser Europe*, ISSN 0966-9809, 2005, vol. 131, no. 131, pp. 37 - 38.

TOMÁNEK, P., DOBIS, P., BENEŠOVÁ, M., GRMELA, L. Near-field study of carrier dynamics in InAs/GaAs quantum dots grown on InGaAs layers. *Materials Science Forum*, ISSN 0255-5476, 2005, vol. 482, no. 1, pp. 151 - 154.

TOMÁNEK, P., GRMELA, L. Local optical phenomena in InAs/GaAs heterostructures with quantum dots and artificial molecules. *Journal of the Korean Physical Society*, ISSN 0374-4884, 2005, vol. 47, no. 96, pp. S162-S165 - 3.

UHDEOVÁ, N. Written examination in Physics: benefits and drawbacks. *Ingenieurpädagogik*, ISSN 0724-8873, 2005, vol. 51, no. 9, pp. 752 - 756.

VRBA, V., CVRK, L., MOLNÁR, K. Grid framework with QoS. *Lecture Notes in Computer Science*, ISSN 0302-9743, 2005, vol. 2005, no. 3420, pp. 27 - 33.

Bachelor's Programme

Physics 1 (Pavel Dobis)

Physics 2 (Milena Kheilová)

Seminar in Physics (Eva Hradilová)

Master's Programme

Solid Phase Physics (Lubomír Grmela)

Modern Physics (Milena Kheilová)

Nanotechnologies (Pavel Tománek)

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

Doctoral Programme

Dielectric Relaxation Spectroscopy (Karel Liedermann)

Physics of Semiconductor Interfaces and Structures (Pavel Hruška)

Stochastic Processes in Solids (Josef Šikula)

Modern Aspects of Optics (Pavel Tománek)

Selforganisation Processes in Nonequilibrium Nonlinear Systems (synergetics) (Marian Štrunc)

Laboratories

Czech Electronic Noise Research Laboratory (research of low-frequency noise, noise spectroscopy, development of non-destructive diagnostic methods and indicators of the reliability of materials and microelectronic components, instruction in Physics of Semiconductors, Structures and Interfaces and Noise Spectroscopy, Josef Šikula)

Laboratory of Dielectric Spectroscopy (research of dielectric relaxation spectroscopy, monitoring molecular dynamics of dielectric materials, instruction in Non-Destructive Diagnostics of Materials, Semiconductors and Dielectrics, Karel Liedermann)

Laboratory for Physics (instruction in Physics 1, Physics 2 and Physics for Information Technology, Pavel Dobis)

Laboratory of Nanometrology (contactless investigation of material surfaces with transversal super-resolution by means of near-field scanning microscopy, instruction in Physical Fundamentals of Optoelectronics, Modern Aspects of Optics, Pavel Tománek)

Department of Languages

PhDr. Milena Krhutová, Ph.D.

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Lecturers

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Administrative and Technical Staff

Lea Domanská, Hana Vondráčková

Main Interests

The department concentrated on implementation of the integration project of the development of tuition ´Standardization of tuition of English and other languages in the Bachelor's degree programmes at FEKT, FIT a FP´, introducing a new concept of language tuition. New curricula and electronic texts were prepared for the students to achieve the output knowledge of mainly English at the levels given by the European Reference Framework. New evaluation standards in the form of examination tests were introduced. Student motivation was supported by a system of electronic homework tasks for all levels. The implementation of the project required personal and space expansion of the department, with new didactic aids, textbooks, CDs and library for students.

New courses of professional English and German were introduced in the Master's and the Doctoral programme. The department provided tuition for students in all degree programmes at the Faculty of Information Technology, and for students of Management Informatics at the Faculty of Business and Management.

Research was focused on professional language of electrical engineering and on methodology and didactics of teaching languages at a technical university. Research results were presented at international conferences and in scientific journals. Within the framework of the development project the department cooperated with other language departments at Brno University of Technology. The department also cooperated with the Institute of English and American Studies at the University of Vienna, Austria where the subject of research were contrastive studies of professional language, and was involved in the project ´Writing Professional English´ coordinated by the Faculty of Mechanical Engineering, Brno University of Technology. The staff of the department provided language support for the faculty's research plans.

For two years the department has also included an economic and psychological section, which has expanded and innovated offered courses.

The department will continue to introduce or innovate all courses which may contribute to the professional qualifications of graduates.

Major Achievements

The department's staff participated in the following projects:

Krhutová, M. Co-investigator of the research and development project 9950003614 ´Integration Project of the Development of Language Tuition in English, Increasing the Language Competence Including Internationalization of Study Programmes´ and the partial project at FEEC ´Standardization of Tuition of English Language and Other Languages in Bachelor's Study Programmes at FEEC, FIT and FBM´.

Neuwirthová, L; Malíková. D. Participation in the research and development project 9950003614 ´An Integration Project of the Development of Language Tuition in English, Increasing the Language Competence Including Internationalization of Study Programmes´

Malíková, D. Participation in Leonardo da Vinci project CZ/02/B/F/LA-1340437 ´Writing Professional English´.

Neuwirthová, L. Participation in Leonardo da Vinci project CZ/02-134009 ´Interactive and Unified E-Based Education and Training in Electrical Engineering´, language support.

Borecká, M. Participation in project ´Development of Distance and Part-Time Formats of Education´, language support for FIT.

Borecká, M. Participation in international grant project Leonardo ´IST Requalification of Disabled Persons´, CZ/04/B/F/NT 168025, language support.

Research results were published at the following conferences and in scientific journals:

Krhutová, M, Malíková, D. ´The Role of ELT in Internationalization of Structured Study Programmes´. International Conference of Engineering Education "International Interlink", Gliwice, Poland, 2005.

Krhutová, M. ´The Challenges of Changing the Status of a Language Department at a Technical University´, *Ingenieurpädagogik*.

Neuwirthová, L. ´European Compatibility of Academic and Professional Skills for Language Learning in Engineering Education´, *Ingenieurpädagogik*.

Neuwirthová, L. ´Foreign Language Standards as a Framework for University Language Courses´. 8th International Conference CercleS ´Univerzitní jazyková centra: Rozšíření obzorů, nové možnosti spolupráce´ (University centres).

Borecká, M. ´La ensenanza del espanol como lengua extranjera´. Primer Congreso Internacional FIAPE: Español, lengua de futuro,Toledo.

Froehling, K. ´Asterisk (*) on Honesty: the Tragedy of Roger Maris´. 8th Conference of English, American and Canadian Studies, Theory and Practice in English Studies.

Baumgartnerová, A. ´CLIL Application in Tertiary Education´, international seminar Empirical Perspectives on CLIL and Immersion Classrooms.

Baumgartner, L.´Fremdsprachenausbildung und die fehlende Vergleichbarkeit des akademischen Niveaus auf der Fremdsprachenebene am Beispiel der deutschen Sprache als Fremdsprache an den technischorienierten Hochschulen in Tscheien) ´, international seminar Empirical Perspectives on CLIL and Immersion Classrooms.

A member of the department's staff Kenneth Froehling was visiting assistant professor at the Centre of Canadian Studies, Faculty of Arts, Bucuresti University, Romania.

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Selected Publications

KRHUTOVÁ, M. Challenges of Changing the Status of a Language Department at a Technical University. *Ingenieurpädagogik*, ISSN 0724-8873, 2005, vol. 51, no. 9, pp. 494 - 499.

NEUWIRTHOVÁ, L. European Compatibility of Academic and Professional Skills for Language Learning in Engineering Education. *Ingenieurpädagogik*, ISSN 0724-8873, 2005, vol. 51, no. 9, pp. 500 - 510.

Bachelor's Programme

English – Effective Reading Skills (Marcela Borecká)

English – Everyday Conversation (M. A. Kenneth Froehling)

English for Bachelors – pre-Intermediate 1 (Alena Baumgartnerová)

English for Bachelors – pre-Intermediate 2 (Marie Bartošová)

English for Bachelors - Intermediate 1 (Petra Langerová)

English for Bachelors - Intermediate 2 (Jaroslav Trávníček)

Ethics in Business (Helena Pálková)

Engineering Pedagogy and Didatics (Helena Pálková)

Culture of Speech and Generation of Texts (Helena Pálková)

Professional English for Electrical Engineering and Information Technology (Ludmila Neuwirthová)

Laboratory Didactics (Helena Pálková)

Bookkeeping for Managers (Helena Pálková)

German for Intermediate Students 1 (Ladislav Baumgartner)

German for Beginners - Grundkurs 1 (Ladislav Baumgartner)

Business English (Dagmar Malíková)

Pedagogical Practice (Helena Pálková)

Pedagogical Psychology (Helena Pálková)

Double-Entry Bookkeeping (Helena Pálková)

Russian for pre-Intermediate (Alena Baumgartnerová)

Russian for Beginners (Alena Baumgartnerová)

Spanish for pre-Intermediate Students (Marcela Borecká)

Spanish for Beginners (Marcela Borecká)

Master's Programme

English – Effective Reading Skills (Marcela Borecká)

English – Everyday Conversation (M. A. Kenneth Froehling)

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

English - Intermediate (Přemysl Dohnal)

Ethics in Business (Helena Pálková)

Culture of Speech and Generation of Texts (Helena Pálková)

English – pre-Intermediate (Marie Bartošová)

English - Intermediate (Přemysl Dohnal)

Professional English for Electrical Engineering and Information Technology (Ludmila Neuwirthová)

Bookkeeping for Managers (Helena Pálková)

German – pre-Intermediate Grundkurs 2 (Ladislav Baumgartner)

German - Intermediate (Ladislav Baumgartner)

German for Beginners - Grundkurs 1 (Ladislav Baumgartner)

Business English (Dagmar Malíková)

Double-Entry Bookkeeping (Helena Pálková)

Russian – pre-Intermediate (Alena Baumgartnerová)

Russian for Beginners (Alena Baumgartnerová)

Spanish – pre-Intermediate (Marcela Borecká)

Spanish for Beginners (Marcela Borecká)

Doctoral Programme

English for Post-Graduates (Dagmar Malíková)

Department of Mathematics

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Professors
Prof. RNDr. Josef Diblík, DrSc.
Prof. RNDr. Václav Havel, DrSc.
Prof. RNDr. Jan Chvalina, DrSc.
Prof. RNDr. František Neuman, DrSc.

Associate Professors
Doc. RNDr. Jaromír Baštinec, CSc.
Doc. RNDr. Jaroslav Bayer, CSc.
Doc. RNDr. Martin Kovár, Ph.D.
Doc. RNDr. Zdeněk Šmarda, CSc.
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., RNDr. Dana Hliněná, Ph.D., RNDr. Edita Kolářová, RNDr. Vlasta Krupková, CSc., Mgr. Michal Novák, Ph.D., Mgr. Irena Růžičková, 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 2005 the department was responsible for tuition in full-time and part-time Bachelor's degree programme and in the new Master's programme as well as instruction in eight postgraduate courses and a number of courses for the Faculty of Information Technology.

Research was focused on mathematical models of processes described by differential, intro-differential and difference equations with strong non-linearities and errors, including functional equations with delayed argument. Research of multistructures and application models on the basis of these systems involved non-commutative connecting spaces by means of linear differential n-th order operators with continuous coefficients, generation of multistructures on state sets as discrete dynamic systems (multiautomatics). Homogeneous and heterogeneous products were generated for parallel processes modelling. Approximation characteristics of particular definite topological structures, the so-called framework category and their duality were studied. Connection was proven of pointless topology and formal FCA term analysis and theoretical physical applications.

The department closely cooperated with Roger Williams University, Rhode Island, USA, Matematisches Institut Universität Stuttgart and technical universities in Klagenfurt, Dresden, Kiiv, Udine- and Žilina.

The department hosted Professor Denis Khusainov (Technical University Kyiv), Miroslava Růžičková, associate professor (Žilina University), Professor Christine Nowak (Technical University Klagenfurt).

Major Achievements

The research team Prof. Diblík, Baštinec, Durnová, Řezáč) defended the FRVŠ project (1594/2004) ´Multimedia Teaching Text – M1B´.

Prof. Diblík was involved in preparation and organization of international conference ´Dynamical Systems Modelling and Stability Investigations´, Kiev, Ukraine, 23 – 27May 2005.

Prof. Diblík participated in preparation and organization of international conference ´CDDE 2005, Conference on Differential and Difference Equations´, Gdansk, Poland, 24 – 27 August 2005.

Prof. Diblík a Prof. Chvalina were involved in preparation and organization of 4th International Mathematical Workshop, Brno, 20 October 2005.

Assoc. Prof. Baštinec a Prof. Chvalina co-organized ´XXI. International Colloquium on the Acquisition Process Management´ Brno, 16 May 2005.

The department's staff published several original papers in reputed scientific journals:

Diblík, J., Svoboda, Z. Positive solutions of retardér functional differential equations, *Nonlinear Analysis*.

Diblík, J., Baštinec, J. Remark on positive solutions of discrete equation. *Nonlinear Analysis.*

Kovár, M. On iterated dualizations of topological spaces. *Topology and its Applications*.

Kovár, M., Jafari, S., Caldas, M. Some properties of Theta – open Sets. *Divulgaciones Matematicas*.

Neuman, F. Constructing and solving equations-inverse operations. *Aequationes Mathematicae.´*

Major Research Projects

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

Set Theoretical and Categorial Methods in Topology and Algebra – GACR 201/03/0933
Investigator: Miroslav Hušek

Selected Publications

BAŠTINEC, J., DIBLÍK, J. Remark on positive solutions of discrete equations Delta u(k+n)= -p(k)u(k). *Nonlinear Analysis, Theory, Methods and Applications*, ISSN 0362-546X, 2005, vol. 63(2005), no. 11, pp. 2145 - 2 151.

CALDAS, M., JAFARI, S., KOVÁR, M. Some properties of Theta-open Sets. *Divulgaciones Matematicas*, ISSN 1315-2068, 2005, vol. 12, no. 2, pp. 161 - 169.

DIBLÍK, J., KHUSAINOV, D., RŮŽIČKOVÁ, I. Sufficient Conditions for compulsory asymptotic behaviour solutions of scalar discrete equations. *Visnik kiivskogo nacionalnogo universitetu imeni Tarasa Ševčenka*, ISSN 1728-2276, 2005, vol. 2004, no. 5, pp. 17 - 23.

DIBLÍK, J., SVOBODA, Z. Positive solutions of retarded functional differential equations. *Nonlinear Analysis, Theory, Methods and Applications*, ISSN 0362-546X, 2005, vol. 63(2005), no. 11, pp. 813 - 821.

HLINĚNÁ, D., VOJTÁŠ, P. Graded many-valued resolution with aggregation. *Fuzzy Sets and Systems*, ISSN 0165-0114, 2005, vol. 2004, no. 143, pp. 157 - 168.

KOVÁR, M. Hofmann-Mislove Posets. *Topology Proceedings*, ISSN 0146-4124, 2005, vol. 29, no. 2, pp. 1 - 20.

KOVÁR, M. On iterated dualizations of topological spaces. *Topology and its Applications*, ISSN 0166-8641, 2005, vol. 1, no. 146-7, pp. 83 - 89.

NEUMAN, F. Constructing and solving equations - inverse operations. *Aequationes Mathematicae*, ISSN 0001-9054, 2005, vol. 2005, no. 70, pp. 77 - 87.

NEUMAN, F. Systems of not sufficiently smooth functions. *Technical News*, 2005, vol. 2005, no. 1(20), 2(21), pp. 95 - 101.

ŠMARDA, Z. Periodic solutions of systems of integro-differential equations with a small parameter. *Department of Mathematics Report Series*, ISSN 1214-4681, 2005, vol. 2004, no. Vol.12, pp. 61 - 68.

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)

Matrix and Tensor Calculus (Martin Kovár)

Modern Numerical Methods (Jaromír Baštinec)

Probability, Statistics and Operational Research (Jaromír Baštinec)

Selected Parts of Matrix Calculus (Martin Kovár)

Doctoral Programme

Algebra, Combinatorics, Graphs (Václav Havel)

Differential Equations in Electrical Engineering (Jaromír Baštinec)

Discrete Processes in Electrical Engineering (Josef Diblík)

Global Transformations of Functional Equations (František Neuman)

Impulse Function, Applications in Electrical Engineering (Zdeněk Šmarda)

Complex Variable in Electrical Engineering (Josef Diblík)

Logic (Václav Havel)

Numerical Solution of Fields (Jaromír Baštinec)

Operational Analysis (Josef Zapletal)

Statistical Methods of Data Processing (Josef Zapletal)

Variational Calculus, Applications in Electrical Engineering (Zdeněk Šmarda)

Department of Microelectronics

Prof. Ing. Vladislav Musil, CSc.

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Professors

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

Associate Professors

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

Lecturers

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

Postgraduate Students

Ing. Martin Adámek, Ph.D., Ing. Zdeněk Bartoň, Ing. Tomáš Brich, Ing. Jindřich Bulva, Ing. Pavel Cejtchaml, Ing. Lukáš Daněk, Ing. Issa El Dbib, Ing. Richard Ficek, Ing. Tomáš Fořt, Ing. Lukáš Fujcik, Ph.D., Ing. Tomáš Gubek, Ing. Tomáš Havlíček, Ing. Jiří Háze, Ph.D., Ing. Ondřej Hégr, Ing. Radek Helán, Ing. Jiří Hladík, Ing. Luboš Jakubka, Ing. Jaroslav Kadlec, Ing. Zdeněk Král, RNDr. Jan Krejčí, Ing. Kristýna Kubíčková, Ing. Radek Kuchta, Ing. Karel Malysz, 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. Robert Pasz, Ing. Michal Pavlík, Ing. Radomír Plachejda, Ing. Jan Prášek, Ing. Tomáš Procházka, Ing. Roman Prokop, Ing. Ondřej Sajdl, Ph.D., Ing. Michal Skočdopole, Ing. Jiří Stehlík, Ing. Pavel Šteffan, Ing. Petr Tomiczek, Ing. Jaroslav Týnek, Ing. Cyril Vaško, Ing. Michal Vitovský, Ing. Lukáš Vojkůvka

Administrative and Technical Staff

Ing. Daniel Bečvář, Ph.D., Iva Doušková, Jarmila Fučíková, Ing. Petr Hub, Petra Jedličková, Hana Jelínková, PhDr. Jarmila Jurášová, Ing. Ahmad Khateb, Ph.D., Ing. Thibault Mougel, Bc. Petr Novák

Main Interests

In 2005 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's and Master's study programmes. Following a reconstruction the Laboratory of Electronic components was moved and Laboratory of Design of Integrated Circuits was established with support from ON Semiconductor and Cadence for teaching the design system of the company Cadence and for implementation of students´ projects.

Research was focused on basic and applied research of integrated circuits and sensors. The main areas of interest were the design of switching current circuits and evaluation of signals from chemosensors and biosensors, mainly gases and pesticides, simulation and evaluation of 3D linking systems reliability. A unique burning furnace was purchased for preparation of thick-layer sensors.

The department had close mobility cooperation with Bournemouth University in Great Britain and with KHBO Oostende v Belgium and there was research cooperation with BVT Technologies Brno, Autoflug Hamburg, ISEP University, Paris (Professor B. Sviezeny), and research laboratory IMEC-KHBO in Belgium.

In 2006 the department will be engaged in the methods of 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 non-linear dynamic phenomena in fuel systems and design of ASIC circuits for control circuits). The second prototype of the portable device for analysis of heterogeneous substance in fruit and vegetables will be achieved, and the first results of projects focused on preparation of nanocolumns and nanopipes are expected. The department will concentrate on evaluation of reliability of lead-free soldering and linking of solar cells. The department won a European social fund project on further education of secondary school teachers in the latest trends of electronics.

Increased attention will be paid to student stays abroad.

Major Achievements

In 2005 the department's staff participated in two projects of the 5th framework programme of the EU, in six GACR projects, two GAAV projects, 16 FRVS projects and in five Ministry of Trade and Industry projects. In September 2005 the department organized international conference Electronic Devices and Systems EDS2005 where 94 national and international papers on microelectronics and technology were presented.

Assoc. Prof. Szendiuch achieved remarkable results in research of the characteristics and applications of lead-free soldering and modelling of the thermal pension of soldered connections and casings, and presented them at the IMAPS conference in Brugge, IEEE conferences in Vienna and Oslo. The department also participated in a project on the ecological design of electrotechnical device and in organizing a EU workshop with the final meeting in Brussels.

Prof. Biolek, in cooperation with the Department of Electrical & Electronics Engineering, Yeditepe University, Istanbul, developed a transistor structure of the active element CDTA (Current Differencing Transconductance Amplifier) CMOS $0.5\mu m$ MIETEC technology and proposed two applications of these elements, new connections of 2nd order universal filter and quadrature oscillator. Two papers describing these circuits were published in impact journals.

Major Research Projects

Applications of Nanotechniques and Nanomaterials in Chemical Sensors- 1K05018
Investigator: Jaromír Hubálek

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

Identification of the Parameters of Models of Semiconductor Structures – GACR 102/03/0720
Investigator: Milan Recman

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

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

Intelligent Microsensors and Microsystems for Measurement, Regulation and the Environment – GAČR 102/03/0619
Investigator**: Radimír Vrba**

Design of Analog Integrated Circuits in New Technologies – GAČR 102/03/0721
Investigator: Vladislav Musil

Micro- and Nanostructures in Microelectronic Technology – GACR 102/04/P162
Investigator: Jaromír Hubálek

New Principles of Integrated 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 Signals Processing– GA102/05/0277
Investigator:. Dalibor Biolek

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

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

Selected Publications

BIOLEK, D., BIOLKOVÁ, V. Three-CDTA current-mode biquad. *WSEAS Transactions on Circuits*, ISSN 1109-2734, 2005, vol. 4, no. 10, pp. 1 227 - 1 232.

HORÁK, M. Tunnelling and thermionic emission across an abrupt Np heterojunction: The effects of different effective masses. *WSEAS Transactions on Electronics*, ISSN 1109-9445, 2005, vol. 2005 (2), no. 3, pp. 77 - 84.

IVANOV, P., LLOBET, E., STANKOVA, M., VILANOVA, X., HUBÁLEK, J., GRACIA, I., CANÉ, C., CORREIG, X. Towards a micro-system for monitoring ethylene in warehouses. *Sensors and Actuators B: Chemical*, ISSN 0925-4005, 2005, vol. 111-112, no. 1, pp. 63 - 70.

KHATKO, V., HUBÁLEK, J., LLOBET, E., CORREIG, X. X-ray investigations of nanopowder WO3 thick films. *physica status solidi*, ISSN 0031-8965, 2005, vol. 202, no. 10, pp. 1973 - 1979.

KHATKO, V., LLOBET, E., VILANOVA, X., HUBÁLEK, J., MALYSZ, K., CORREIG, X. Gas sensing properties of nanoparticle indium-doped WO3 thick films. *Sensors and Actuators B: Chemical*, ISSN 0925-4005, 2005, vol. 111-112, no. 1, pp. 45 - 51.

MIKEL, B., ČÍP, O., LAZAR, J. Absolute Distance Measurements with Tunable Semiconductor Laser. *Physica Scripta*, ISSN 0031-8949, 2005, vol. 2005, no. 118, pp. 41 - 44.

ŠVÉDA, M., BENEŠ, P., VRBA, R., ZEZULKA, F. Handbook of Sensor Networks. Chapter: *Introduction to Industrial Sensor Networking.* 1. New York: CRC Press, 2005. pp. 1 - 25 . ISBN 0-8943-1968-4

Bachelor's Programme

Analogue Electronic Circuits (Dalibor Biolek)

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)

Microelectronic Practicals (Josef Šandera)

Microelectronics and Assembly Technology (Ivan Szendiuch)

Microsensors and Micromechanical Systems (Radimír Vrba)

Modelling and Computer Simulation (Dalibor Biolek)

Design and Technology of Electronic Instruments (Vladislav Musil)

Design of Analog Integrated Circuits (Daniel Bečvář)

VLSI Digital IC Design and VHDL (Daniel Bečvář)

Optoelectronics and Optical Communications (František Urban)

Management Minimum (Pavel Legát)

Master's Programme

Analog Integrated Circuits (Jaromír Brzobohatý)

Digital Integrated Circuits (Vladislav Musil)

Microelectronics in English (Jaromír Brzobohatý)

Microelectronic Circuits (Daniel Bečvář)

Microelectronic Components and Structures (Michal Horák)

Modeling and Simulation in Microelectronics (Dalibor Biolek)

Modern Technology of Electronic Circuits and Systems (Ivan Szendiuch)

Design of Analog CMOS Circuits (Vladislav Musil)

Design of Digital CMOS Circuits (Vladislav Musil)

Design of Electronic Devices (Radimír Vrba)

Management Minimum (Pavel Legát)

Quality Control (Radovan Novotný)

Technological Processes Control (Radovan Novotný)

PC Technology and Communication (Jaromír Hubálek)

Vacuum Technology (Jaroslav Boušek)

Manufacturing of Electronics Devices (Ivan Szendiuch)

Doctoral Programme

Microelectronics and Management (Ivan Szendiuch)

New Circuit Principles for IC Design (Jaromír Brzobohatý)

Nuclear Magnetic Resonance for Material Diagnostic (Karel Bartušek)

Optoelectronic Transmission Systems and Networks (František Urban)

Switched Circuits and Their Applications (Dalibor Biolek)

Electronic Systems Technology (Ivan Szendiuch)

Interconversion of Analogue and Digital Signals (Radimír Vrba)

Laboratories

Laboratory of Biosensors (research laboratory, Jaromír Hubálek)

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

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

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

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

Optoelectronics and Laser Laboratory (instruction in Optoelectronics, implementation of the technical part of student projects, František Urban)

Vacuum Technology Laboratory (instruction in Vacuum Technology and Cryotechnology, Jaroslav Boušek and Josef Šandera)

Computer Laboratory (numerical exercises for different subjects, students self-study, work with the Internet, Petr Hub, Jan Prášek)

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Prof. Dr. Ing. Zbyněk Raida
Prof. Ing. Václav Říčný, CSc.
Prof. Ing. Jiří Svačina, CSc.
Prof. Ing. Vladimír Šebesta, CSc.

Associate Professors

Doc. Ing. Lubomír Brančík, CSc.
Doc. Ing. Stanislav Hanus, CSc.
Doc. Ing. Miroslav Kasal, CSc.
Doc. Dr. Ing. Zdeněk Kolka
Doc. Ing. Jaromír Kolouch, CSc.
Doc. Ing. Zdeněk Nováček, CSc.
Doc. Ing. Milan Sigmund, CSc.
Doc. Ing. Otakar Wilfert, CSc.

Lecturers

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

Postgraduate Students

Ing. Vladimír Axman, Ing. Milan Boštík, Ing. Karel Čermák, Ing. Jiří Dřínovský, Ing. Pavel Dýmal, Ing. Lukáš Džbánek, Ing. Jakub Džubera, Ing. Zbyněk Fedra, Ing. Ondřej Franek, Ing. Tomáš Frýza, Ing. Filip Gleissner, Ing. Petr Goldman, Ing. Ondřej Hála, Ing. Martin Hampl, Ing. Ivo Hertl, Ing. David Hlaváč, Ing. Jiří Horák, Ing. Martin Horák, Ph.D., Ing. Pavel Hovořák, Ing. Rostislav Hučka, Ing. Petr Chmela, Ing. Pavel Chytil, Ing. Tomáš Kašparec, Ing. Tomáš Kratochvíl, Ing. Martin Kravka, Ing. Vítězslav Krčmář, Ing. Petr Křivák, Ing. Petr Kučera, Andy Alexander Kuiper, Ing. Petr Kutín, Ing. Radek Kvíčala, Ing. Jaroslav Láčík, Ing. Vishwas Lakkundi, Ing. Zbyněk Lukeš, Ph.D., Ing. Pavel Matějka, Ing. Zdeněk Mikéska, Ing. Jan Mikulka, Ing. Milan Motl, Ing. Vlastimil Navrátil, Ph.D., Ing. Lukáš Oliva, Ing. Viktor Otevřel, Ing. Jiří Petržela, Ing. Ondřej Pirochta, Ing. Petr Poměnka, Ing. Václav Pospíšil, Ing. Jan Prokopec, Ing. Bohdan Růžička, Ing. Zdeněk Růžička, Ing. Martin Slanina, Ing. Petr Stančík, Ing. Tomáš Sutorý, Ing. Václav Šádek, Ing. Jan Šebesta, Ing. Josef Šíp, Ing. Petr Šmíd, Ing. Jiří Špaček, Ing. Dalibor Štverka, Ing. Martin Švirák, Ing. Roman Tkadlec, Ing. Tomáš Urbanec, Ing. Petr Vágner, Ing. Michal Vavrda, Ing. Ivo Viščor, Ing. Martin Vlk, Ing. Josef Vochyán, Ing. Michal Zamazal, Ing. Luděk Závodný

Administrative and Technical Staff

Květuška Bílá, Anna Kalná, Radka Kielarová, Ing. Petr Kutín, Vishwas Lakkundi, Jaroslav Novák, Bohuslava Raidová, Petra Šípová, Aleš Vanžura, Jaroslav Voráč

Main Interests

Tuition was provided in the Bachelor's degree programme (31 subjects in 5 study areas), ending five-year Master's programme (28 subjects in 2 areas), new follow-up Master's programme (9 subjects in 3 areas) and Doctoral degree programme (18 study areas). Tuition is focused on analog, digital and microprocessor electronic circuits and systems, signal processing and applications, aerials and electromagnetic waves propagation, special areas of communications and electronic communications – wireless, satellite and optical. The department provided tuition in English for students paying their fees (3 subjects), at University of the Third Age (3 subjects) and in Continuing Education courses for other institutions (GDC Honeywell, T-Mobile CZ, Gitty), including individual projects of international students (12 students from Spain, France, Belgium, Germany, India and Slovakia).

Research work is linked with teaching activities and is focused on the following areas:

Theory of electronic circuits and systems, application of electronic circuits and systems in communication, control and industrial technology, signal processing and application in serial processing and digital radioelectronics, electromagnetic waves, aerials, microwaves, optoelectronics, EMC, special electronic communications (mobile, satellite, optical and cable-free communications).

The department's staff were involved in grant projects and funded by different institutions as well as in cooperation with national and international partners. In 2005, the department participated in 48 research, development and pedagogical projects. The department was the coordinator of one of the major Ministry of Education research plans at Brno University of Technology ´New Generation Electronic Communication Systems and Technologies´ (ELKOM)´ (Investigator: Jiří Svačina), scheduled for the period 2005 - 2011.

Major Achievements

Completed development and implementation of PSK-31 transponder for narrow-band data communication with extreme spectral efficiency. Within the project PCSAT 2 of US Naval Academy, Maryland, USA the transponder was launched in the space shuttle Discovery to the international space station ISS and on 3 August 2005 set to permanent operation. The chief investigator of PSK-31 is M. Kasal who cooperated with postgraduate students M. Zamazal and P. Kutín.

The 15th International Czech-Slovak Conference RADIOELEKTRONIKA 2005 was held on 3 and 4 May 2005 (in cooperation with the Slovak Technical University in Bratislava, the Czech-Slovak section of IEEE, Czech Electrotechnical Society and the Czech Committee of URSI) with 5 communication sections and one poster section, 130 participants from 6 countries.

The department was highly successful in obtaining grant projects. In 2005 a new research plan of the Ministry of Education was obtained, 13 GACR

projects (among them 3 post-doctoral projects), 24 FRVS projects and 11 research and development projects for other institutions (AMSAT DL, US Naval Academy, Zentr. f. soziale Innovation Wien, Ministry of Industry and Trade of the Czech Republic, Academy of Science of the Czech Republic, T-Mobile CZ, National Security Office of the Czech Republic). The projects earned over 30 mil. CZK.

In 2005 the postgraduate students at the department defended 11 dissertations in the study areas EST and TEE (two of them in a joint Czech-German postgraduate study programme), and two dissertations have been submitted.

Two postgraduate students won Werner von Siemens Excellence Award 2005 for the best dissertation (A. Čáp, supervisor Prof. Z. Raida) and V. Navrátil (supervised by Prof. J. Svačina and Dr. M. Leone, Corporate Technology, Germany).

Major Research Projects

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

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

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

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

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

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

Mobile Network Modelling and Optimization – GACR 102/04/2080

Investigator: Stanislav Hanus

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

Novel Electronic Circuits with Modern Multiple-Gate Operating Blocks – GACR 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 – GACR 102/04/1079
Investigator: Zbyněk Raida

Modeling and Synthesis of Digital and Mixed 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 – GACR 102/04/0557
Investigator: Vladimír Šebesta

Selected Publications

BIOLEK, D., BIOLKOVÁ, V. Three-CDTA current-mode biquad. *WSEAS Transactions on Circuits*, ISSN 1109-2734, 2005, vol. 4, no. 10, pp. 1227 - 1 232.

BRANČÍK, L. Elaboration of FFT-based 2D-NILT Methods in Terms of Accuracy and Numerical Stability. *Przeglad Elektrotechniczny*, ISSN 0033-2097, 2005, vol. LXXXI, no. 2, pp. 84 - 89.

BRANČÍK, L. Novel Techniques for Sensitivity Evaluation in Multiconductor Transmission Line Systems. *WSEAS Transactions on Communications*, ISSN 1109-2742, 2005, vol. 4, no. 5, pp. 216 - 223.

DOSTÁL, T. Computational methods in circuits and systems applications. Chapter: Universal N-order ARC filters using current conveyors and multi-output current followers. 1st ed. Athens: WSEAS Press, 2005. pp. 207 - 210 . ISBN 960 8052 882

GLEISSNER, F., HANUS, S., MIKULKA, J. Optimalization of Interference in Mobile Network. *WSEAS Transactions on Communications*, ISSN 1109-2742, 2005, vol. 4, no. 2, pp. 180 - 185.

GREGOR, J., JAKUBOVÁ, I., ŠENK, J., HRABOVSKÝ, M. Distribution of mass fractions in the free jet of hot gas mixture (IF 0,194). *High Temperature Material Processes: An International Journal*, ISSN 1093-3611, 2005, vol. 9, no. 1, pp. 37 - 43.

KOLKA, Z., POSPÍŠIL, J., HANUS, S., POSPÍŠIL, V. Optimized State Models of PWL Dynamical Systems and their Relation to Canonical Models of Class C. *WSEAS Transactions on Systems*, ISSN 1109-2777, 2005, vol. 4, no. 6, pp. 691 - 698.

KRATOCHVÍL, T. Digital Image Transmission Simulation Using the DVB Forward Error Correction Codes. *Automatika*, ISSN 0005-1144, 2005, vol. 45, no. 1-2, pp. 41 - 46.

MIKÉSKA, Z., HANUS, S., VOCHYÁN, J. Identification of devices in Bluetooth networks. WSEAS *Transactions on Communications*, ISSN 1109-2742, 2005, vol. 2005, no. 1, pp. 273 - 276.

MIKULKA, J., HANUS, S., GLEISSNER, F. Modeling of Bluetooth and IEEE 802.11b Interference. *WSEAS Transactions on Communications*, ISSN 1109-2742, 2005, vol. 4, no. 2, pp. 186 - 192.

PETRŽELA, J., POSPÍŠIL, V., HANUS, S. On the Design of Robust Chaotic Oscillator. WSEAS *Transactions on Circuits*, ISSN 1109-2734, 2005, vol. 5, no. 1, pp. 32 - 38.

SVAČINA, J. Open-Area Test Site Measurements: Dealing with Ambients. *Compliance Engineering Magazine – 2005 Annual Reference Guide*, 2005, vol. XXII, no. 1, pp. 68 - 71.

ŠEBESTA, J., ŠEBESTA, J. Universal DSP Based System for Communication with AMSAT Experimental Satellites. *WSEAS Transactions on Communications*, ISSN 1109-2742, 2005, vol. 2005, no. 1, pp. 16 - 19.

WILFERT, O., KOLKA, Z., BIOLKOVÁ, V. Model of Beam Interruptions for Free Space Optical Systems. *WSEAS Transactions on Systems*, ISSN 1109-2777, 2005, vol. 2005, no. 4, pp. 2153 - 2 155.

WILFERT, O., PROKEŠ, A. Laser System for Determination of Target Cross Section in Optical Band. *WSEAS Transactions on Systems*, ISSN 1109-2777, 2005, vol. 2005, no. 4, pp. 1952 - 1 956.

Bachelor's Programme

Analogue Electronic Circuits (Lubomír Brančík)

Electric Filters (Tomáš Dostál)

Electromagnetic Compatibility (Jiří Svačina)

EM Waves, Antennas and Lines (Zdeněk Nováček)

Electronic Practice (Marta Krátká)

Pulse and Digital Techniques (Jaromír Kolouch)

Communication Systems (Aleš Prokeš)

Microprocessor Techniques (Václav Michálek)

Electronic Instruments Feeding (Jiří Šebesta)

LF Electronics (Tomáš Kratochvíl)

Optoelectronics (Otakar Wilfert)

Computers and Programming 2 (Zbyněk Raida)

CAD of Electronic Circuits (Zdeněk Kolka)

Computers in Communication Systems (Zbyněk Raida)

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)

HF and Microwave Techniques (Stanislav Hanus)

HF Techniques and Antennas (Miroslav Kasal)

Fundamentals of TV Technology (Václav Říčný)

Master's Programme

Speech Signal Analysis and Synthesis (Milan Sigmund)

Antennas and Radio Waves Propagation (Zdeněk Nováček)

Wireless and Mobile Communications (Stanislav Hanus)

CAD in High-Frequency and Microwave Technology (Zbyněk Raida)

Electromagnetic Compatibility (Jiří Svačina)

Elektronik in Deutsch (Milan Sigmund)

Quantum and Laser Electronics (Otakar Wilfert)

Pulse and Digital Techniques (Jaromír Kolouch)

Quantum and Laser Electronics (Otakar Wilfert)

Microcomputers in Instrumentation Applications (Václav Michálek)

Microprocessor Techniques (Václav Michálek)

Electronic Instruments Feeding (Jiří Šebesta)

Electronic Circuits and Filters Design (Tomáš Dostál)

Radio Links Design (Zdeněk Nováček)

LF Technique (Tomáš Kratochvíl)

Optoelectronics (Otakar Wilfert)

Computer and Communication Networks (Zdeněk Kolka)

Programmable Logic Devices (Jaromír Kolouch)

Radars and Navigation (Jiří Šebesta)

Radio Receivers and Transmitters (Aleš Prokeš)

PC Design and Simulation of Electronic Circuits (Zdeněk Kolka)

Radio Relay and Satellite Communication (Miroslav Kasal)

Special Electronic Devices and their Applications (Jiří Svačina)

Television Distribution Networks (Václav Říčný)

Television Cable Links (Václav Říčný)

Television Technique (Stanislav Hanus)

Electronic Circuits Theory (Tomáš Dostál)

Radio Communications Theory (Roman Maršálek)

Videotechnology (Václav Říčný)

HF and Microwave Techniques (Stanislav Hanus)

Doctoral Programme

Computer Simulation Algorithms for Linear and Non-Linear Electronic Circuits (Lubomír Brančík)

Electromagnetic Waves in Communications (Zdeněk Nováček)

Generation and Processing of Signals in Instrumentation Technique (Miroslav Kasal)

Methods for Modelling and Analysis of Electronic Circuits (Zdeněk Kolka)

Modelling of Chaos in Electronic Circuits (Jiří Pospíšil)

Modern Analogue Filters (Tomáš Dostál)

Neural Networks and Fuzzy Systems (Vladimír Mikula)

Numerical Methods in Electrical Engineering (Zbyněk Raida)

Optimization in Electrical Engineering (Zbyněk Raida)

Modern Methods In Optical Communication (Otakar Wilfert)

Special Measurement in EMC (Jiří Svačina)

Selected Topics of Wireless and Mobile Communication Systems (Stanislav Hanus)

Selected Topics of Digital Techniques (Jaromír Kolouch)

Selected Topics of Digital Wireless Communication (Aleš Prokeš)

Selected Problems of TV Technique (Václav Říčný)

Selected Topics of Signal Analysis (Vladimír Šebesta)

Speech Signal Processing for Speaker Recognition (Milan Sigmund)

Laboratories

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

Laboratory of Aerials and Electromagnetic Field (research and instruction in electromagnetic fields, aerials and radio connections design, Zdeněk Nováček)

Laboratory of Digital and Microprocessor Technology (instruction in digital and microprocessor technology, Viera Biolková, Václav Michálek)

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

Laboratory of Mobile Communication and HF Technology (research and instruction in mobile wireless communication and HF technology, Stanislav Hanus)

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

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

Laboratory of Signals and Data Transmission (research and instruction in signals, systems and data transmission, Aleš Prokeš)

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

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

Personal Computer Laboratory (three computer rooms for instruction in circuits, signals and systems, and in 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, development of devices for digital video technology, Václav Říčný)

Research and Development Laboratory of Mobile Communications (a joint 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 AMSAT (research and development of components and subsystems for satellite communication and navigation, telemetric and command station of the P3 satellite of the international organization AMSAT, Miroslav Kasal)

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

Research Laboratory for Digital Processing of Signals (research of methods and techniques of digital processing of signals, speech signal processing and digital radio technology, Vladimír Šebesta)

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 interference emissions measurement and electromagnetic resistance testing, Jiří Svačina)

Department of Telecommunications

Prof. Ing. Kamil Vrba, CSc.
Head

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Professors

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Prof. Ing. Kamil Vrba, CSc.

Associate Professors

Doc. Ing. Karel Burda, CSc.
Doc. Ing. Miloslav Filka, CSc.
Doc. Ing. Vladimír Kapoun, CSc.
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. 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 Číka, Ing. Radim Číž, 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, Ing. Pavel Kania, Ing. Michal Kohoutek, Ing. Vítězslav Kot, Ing. Jaroslav Koton, Ing. Ivan Koula, Ing. Petr Kovář, Ing. Jiří Krejčí, Ing. Václav Křepelka, Ing. Vítězslav Křivánek, Ing. David Kubánek, Ph.D., Ing. Martin Kyselák, Ing. Tomáš Langer, Ing. Tomáš Lukl, Ing. Vladimír Malenovský, 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. Jiří Schimmel, Ing. Jaromír Skřipský, Ing. Jaroslav Snášel, Ing. Michal Soumar, Ing. Vojtěch Stejskal, Ing. Martin Sýkora, Ing. Petr Sysel, 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

Administrative and Technical Staff

Radim Burget, Jan Coufal, DiS., doc. Ing. Milan Chmelař, CSc., Jaroslav Klon, Magda Lounková, Jitka Macháčková, Jaroslav Meixner, Pavel Novotný, Lukáš Pazdera, Bc. Lucie Pernicová, Zdeněk Procházka, Jitka Šichová, Ing. Robert Vích, DrSc.

Main Interests

The department is involved in instruction and research in the Bachelor's study programme Teleinformatics. The concept of the study programme reflects the convergence of communication and information technologies. The provided instruction seeks balance between mobile and stationary communications, computer systems and networks, design of network applications in various programming languages. Instruction also covers design of analog and digital circuits, microprocessors and signal processors, and mainly their applications. The students can also specialize in multimedia i.e. digital processing of speech, music and images. At the expense of nearly 3.1 million CZK the department set up a laboratory of multimedia services where those interested can learn how to set up and organize videoconferences, and create other ways of communication.

The department has been successful in receiving funds from education and research projects. In 2005 the department's research and development teams were involved in basic and applied research projects amounting to over 18.5 million CZK. A research team has been engaged in up-to-date multimedia services through mobile and wireless networks. The department's staff members are involved in a research and development programme of the Ministry of Trade and Industry. Within this research, close cooperation was started with the companies GiTy a.s., VÚSH a.s., DISK Multimédia s.r.o., WESTCOM s.r.o., EN-JOY s.r.o. SEV Litovel, ÚRE Academy of Sciences, MEgA-Měřicí Energetické aparáty, s.r.o., GTS Czech a.s. A practical outcome of this research is e.g. user-friendly videoconferencing, modular architecture of information and videoconferencing systems, contactless measurement of filtering networks or the development of a new generation communication system, universal architecture for DTV multicast for IP networks.

Major Achievements

During the year, the laboratory for testing modern network technologies was established. The central component of the laboratory is the pointer Cisco 2610XM and the switches Catalyst 3750G-24T-E and Catalyst C2950T-24 from Cisco Systems. The whole network is protected by the PIX 515 firewall with security rules set up to secure complex safety of computers and other laboratory equipment.

Another important part of the laboratory network are two access points of the company Aironet 1231G from Cisco Systems. Access points are equipped with an external omnidirectional aerial. Also available are several combined wireless network interfaces Aironet CB21AG supporting technologies 802.11a, 802.11b i 802.11g. The software protocol analyzer Observer is installed in five laboratory workstations for extended monitoring and analysis of the stationary and wireless local network operation. In cooperation with Motorola, Ltd a laboratory of mobile network technologies was set up. The major components of the laboratory are the base station and base station controller. This equipment represents the access part of mobile networks. These products are commonly used by mobile network operators. The base station contains two radio modules, on 900 MHz and 1800 MHz to enable the operator to monitor the handovers in a mobile network. The testing mobile network also contains a transcoder for speech signal processing.

Staff members co-organized the international conference 'Telecommunications and Signal Processing TSP'04'. The department provides technical support for publishing the Czech electronic journal www.Elektrorevue.cz

Major Research Projects

Analysis of xDSL Transmission Parameters Using Real Access Networks – GACR 102/03/0762
Investigator: Karel Němec

Applied Research of Protected Internet Communication with Remote End Power Devices - 1ET110530523
Investigator: Jiří Mišurec

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

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

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

New Methods of Service Quality Assurance in New Generation Networks – GACR 102/03/0560
Investigator: Vladimír Kapoun

Limits for Broadband Signal Transmission on the Twisted Pairs and Other System Co-existence – GACR 102/03/0434
Investigator: Vladislav Škorpil

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

Sophisticated Noise and Interference Suppressors for New Generation Fixed and Mobile Networks– 1ET301710509
Investigator: Zdeněk Smékal

Synchronization of Block Codes for Modular Cryptographic Systems BRI ISDN and PŘI ISDN – ST200520005002
Investigator: Karel Burda

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

Development and Application of New Active Elements UCC, UVC, MOTA – GACR 102/03/1465
Investigator: Kamil Vrba

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

Architecture of Information and Videoconferencing Systems– MPO FT-TA/081
Investigator: Kamil Vrba

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

New Generation Centre-Controlled Infusion Pumps - 1ET110540521
Investigator: Pavel Šilhavý

Research of Technologies and Systems of Real-Time Sound Processing – 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

Design of User-Friendly Videoconferencing Technologies– MPO FD-K3/045
Investigator: Václav Zeman

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

Selected Publications

BURDA, K. The concept of the complex cryptographic protection for telecommunication networks. *International Journal of Computer Science and Network Security*, ISSN 1738-7906, 2005, vol. 5., no. 10, pp. 231 - 233.

CVRK, L., ZEMAN, V., KOMOSNÝ, D. H.323 Client-Independent Security Approach. *Lecture Notes in Computer Science*, ISSN 0302-9743, 2005, vol. 2005, no. 3421, pp. 673 - 680.

DOSTÁL, O. Metropolitan Digital Imaging System in Medicine. *Parliament Magazine, London, Dod's Parliamentary Communications (GBR)*, 2005, vol. 2005, no. 210, pp. 64 - 64.

DOSTÁL, O. Regional educational and research centre for processing of medical image information. *Computer Assisted Radiology and Surgery*, ISSN 0531-5131, 2005, vol. 2005, no. 1281, pp. 911 - 914.

GESCHEIDTOVÁ, E., KUBÁSEK, R., SMÉKAL, Z., BARTUŠEK, K. Automatic Adjustment of Time-Variant Thresholds when Filtering Signals in MR Tomography. *Lecture Notes in Computer Science*, ISSN 0302-9743, 2005, vol. 2005, no. 3421, pp. 384 - 391.

HERMAN, I., HABR, M., VAJDÍK, M. Data Transmission Using Inductive Method in Mobile Applications.. *WSEAS Transactions on Communications*, ISSN 1109-2742, 2005, vol. 7, no. 4, pp. 522-526 - 525.

HERMAN, I., VAJDÍK, M., HABR, M. Data Transmission via Power Line for Lighting Point Monitoring System. *WSEAS Transactions on Communications*, ISSN 1109-2742, 2005, vol. 7, no. 4, pp. 526 - 1 055.

HUCZALA, M. Networking with Digital Signal Processor TI C6412. *Elektrotechnica & Elektronica*, 2005, vol. 2005, no. 7, pp. 1 - 9.

KOMOSNÝ, D. Voice/Data Integration in Municipal Transport Management. *WSEAS Transactions on Communications*, ISSN 1109-2742, 2005, vol. 1, no. 4, pp. 20 - 23.

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KOMOSNÝ, D., CVRK, L. Simulation of Large IP-based Multimedia Distributions. *Technological Advances in Telecommunications and Computer Networks, ISSN 1698-1073*, 2005, vol. 2005, no. 9, pp. 110 - 114.

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VRBA, K., LATTENBERG, I., KUBÁNEK, D. Signal processing for high-speed data communication using pure current mode filters. *Lecture Notes in Computer Science*, ISSN 0302-9743, 2005, vol. 3421, no. , pp. 50 - 53.

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Bachelor's Programme

Analog Technology (Kamil Vrba)

Signals and Systems Analysis (Zdeněk Smékal)

Network Architecture (Vít Novotný)

Digital Filters (Zdeněk Smékal)

Digital Signal Processing (Jiří Mišurec)

Data Communication (Karel Němec)

Audioengineering (Ladislav Káňa)

Hardware Computer Networks (Karol Molnár)

Communication Technology (Ivo Herman)

Design and Technology of Electronics Devices (Kamil Vrba)

Multimedia Services (Zoltán Nagy)

Practical Exercises in Information Networks (Karol Molnár)

Transmission Media (Miloslav Filka)

Access and Transport Networks (Vladislav Škorpil)

Network Operating Systems (Dan Komosný)

Studio and Music Electronics (Ladislav Káňa)

Terminal Equipment (Vít Novotný)

High-Speed Communications Systems (Vladislav Škorpil)

Fundamentals of Computer Print and Graphics (Pavel Rajmic)

Master's Programme

Analog Technique (Kamil Vrba)

Security of Information Systems (Karel Burda)

Digital Filters (Zdeněk Smékal)

Digital Audio Signal Processing (Miroslav Balík)

Digital Signal Processing (Zdeněk Smékal)

Data Communication (Karel Němec)

Digital Transmission System (Vladislav Škorpil)

Digital Exchanges (Vladimír Kapoun)

Audioengineering (Ladislav Káňa)

Integrated Networks (Vít Novotný)

Communications Networks and Engineering (Ivo Herman)

Design and Technology of Electronics Devices (Kamil Vrba)

Cryptography (Václav Zeman)

Management and Marketing (Ivan Rampl)

Microprocessors Technique in Telecommunications (Miroslav Balík)

Multimedia (Zoltán Nagy)

Optical Networks (Miloslav Filka)

Parallel Processes in Operational Systems (Ivo Herman)

Computers and Peripheries (Miroslav Balík)

Advanced Communication Techniques (Ivo Herman)

Access and Transport Networks (Vladimír Kapoun)

Communication Systems (Karel Němec)

Sensor Systems (Ivan Rampl)

Signal Processors (Zdeněk Smékal)

ISDN Services (Vladislav Škorpil)

Telecommunication Devices Maintenance (Vladislav Škorpil)

Studio and Music Electronics (Ladislav Káňa)

Telecommunications Optical Networks (Miloslav Filka)

Transmission Lines (Miloslav Filka)

Telematic and Multimedia Services (Zoltán Nagy)

Theory of Informatics (Zoltán Nagy)

Theory of Communication (Vladimír Kapoun)

Theory of Communication (Karel Burda)

Terminal Equipments (Vít Novotný)

Telecommunication Devices Maintenance (Vladislav Škorpil)

High-Speed Communications Systems (Vladislav Škorpil)

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

Doctoral Programme

Active Elements Using the Current Mode (Ivan Koudar)

Speech Analysis and Synthesis (Robert Vích)

Applied Cryptography (Karel Burda)

Integration of Telecommunication Networks and Services (Vladimír Kapoun)

Communication Media for Data Transmission (Miloslav Filka)

Modern Network Technologies (Karol Molnár)

Advanced Teleinformatics Systems (Vladislav Škorpil)

Sensor Information Systems (Ivan Rampl)

Signal Processors (Zdeněk Smékal)

Specification of In-built Computer Systems (Miroslav Švéda)

Laboratories

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

Laboratory of Wireless Computer Networks and XoIP (operation in wireless computer networks, access part of second generation mobile networks, voice and video transmission on IP networks, Karol Molnár, Vít Novotný)

Laboratory of Digital Music Studio (instruction and research of synthesis, analysis, processing and reproduction of music signals, Zdeněk Smékal, Jiří Schimmel)

Laboratory of Electroacoustics, Studio and Music Electronics (electroacoustic converter measurement, acoustic educational programmes, examining of human hearing, testing of electroacoustic devices, anechoic room, Ladislav Káňa)

Laboratory of Coherent Imaging (research of coherent, 2D and 3D imaging and subsequent digital image analysis, Kamil Vrba, Zoltán Nagy)

Laboratory of Modern Network Technologies (instruction in network technologies, research in changeover switches and indicators management, analysis of stationary and wireless local computer networks, , Karol Molnár)

Laboratory of Multimedia Services (research in design and providing of multimedia communication services including digital processing of multimedia data, Zoltán Nagy)

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

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

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

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

Laboratory of Sensor Systems (measurement of the properties of sensors, smart sensors and circuits of sensor signal processing, demonstration line of industrial sensor system ADAM, research of ICA and BSS methods, Ivan Rampl)

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

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

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

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

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

Department of Theoretical and Experimental Electrical Engineering

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Professors

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Associate Professors

Doc. Ing. Karel Bartušek, DrSc.
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 Kadlecová, Ph.D., Ing. Miloslav Steinbauer, Ing. Miroslav Veselý, Ing. Martin Zlomek, Ph.D.

Postgraduate Students

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

Administrative and Technical Staff

Ing. Ivo Běhunek, Ph.D., Eva Cupáková, Veronika Raabová, Ing. Jan Rychnovský, Ing. Alice Špérová

Main Interests

Research was centred on numerical modelling in impedance tomography (IT) methods. Contacts were maintained or established with universities in Austria and USA. Cooperation continued with the Institute of Instrumentation Technology of Academy of Sciences in evaluation of MR images with support of numerical modelling. The department is involved in evaluation of NMR images in highly disturbed or distorted NMR signals. Long-term cooperation with ABB EJF s.r.o. Brno continued in dealing with lifetime of measuring transformers. The department developed cooperation with ESB in technological processes by way of revitalization of power machines and devices. Design of data bus was accomplished, in cooperation with TES s.r.o, for measurement in nuclear power plants. In cooperation with the Ministry of Trade and Industry and company PROTOTYPA the development of pulse sources on the principle of MHD. Studies and basic experiments with prototypes were carried out in Faraday induction law up to the output of 20GW. Cooperation continued with VOP 026 Šternberk, VTUPV in research of a microwave source – vircator in TESLA Vršovice and optimization of pulse power source. The achieved results and experience with measurement and metrology of ultrashort single electromagnetic pulses were presented at the 3rd European Symposium of non-killing weapons. Cooperation was maintained with the Institute of Plasma Physics of Academy of Science in the development of the vircator. Cooperation was established with Masaryk University, Brno in the design of electro-optical workplace for research of Arctic biotope research. Research was carried out of the methods of measuring concentration of aerial ions. The measuring system was implemented. Basic and applied research into measurement of single electromagnetic pulses has been conducted as support for the above projects. The prototype of a calorimetric sensor for pulse output (Pmax=50kW-300GW) measurement was implemented. Experimental preparations for pulse measurement using electro-optical methods. Prototypes of mini- and microgenerators for 6RP- EADS, Dassoult, Eurocopter consorcium. Students of all degree programmes are involved in the projects.

Major Achievements

Conclusions of experimental research of measurement techniques for gradient magnetic fields and of research of filtering techniques on the basis of wavelet transformation and banks of filters as well as results of the theoretical research of impedance tomography techniques were presented.

A prototype of a calorimetric sensor for reading immediate values of electromagnetic pulse output was implemented in cooperation with PROTO-TYPA a.s. Brno, as well as a prototype of pulse generator based on the MHD principle and a prototype of an innovated pulse generator PGV-II.

Four different concept prototypes of vibration mini- and microgenerators were implemented. Designed and implemented was a high-voltage pulse resistance voltage divider for measurement in pulse generator PGV-II. Further implemented was a special light source (high flow of light without infra areas) for application in research of Arctic plants, for Masaryk University. A measuring current and voltage transformer was implemented with an optimum design of outside insulators for the longest possible lifetime in aggressive environment.

Contacts were established with Professor Hiroshi Kikuchi who gave a lecture in Brno. Basic research will be concerned with microscopic electrodynamic models with focus on biomedicine, Tokyo University.

Research results were presented in the following publications:

Gescheidtová, E. et al. Automatic Adjustment of Time-Variant Thresholds when Filtering Signals in MR Tomography. *Lecture Notes in Computer Science*.

Smékal, Z., Gescheidtová, E., Bartušek, K., Dokoupil, Z. Digital Signal Processor for Data Transfer and Processing in MR Tomography. *International Transaction on Computer Science and Engineering.*

Major Research Projects

Electric Impedance Tomography in Loss Environment – GACR 102/03/1108
Investigator: Libor Dědek

Simulation and Optimization of Integrated Electronic Systems Focused on Signal Integrity – GACR 102/03/0241
Investigator: Lubomír Brančík

Selected Publications

GESCHEIDTOVÁ, E., KUBÁSEK, R., SMÉKAL, Z., BARTUŠEK, K. Automatic Adjustment of Time-Variant Thresholds when Filtering Signals in MR Tomography. *Lecture Notes in Computer Science*, ISSN 0302-9743, 2005, vol. 2005, no. 3421, pp. 384 - 391.

HÁJEK, K., SEDLÁČEK, J. Lossy LC Ladder Prototypes and their Use for ARC Filter Optimization. *WSEAS Transactions on Electronics*, ISSN 1109-9445, 2005, vol. 2005, no. 6, pp. 94 - 99.

SMÉKAL, Z., GESCHEIDTOVÁ, E., BARTUŠEK, K., DOKOUPIL, Z. Digital Signal Processor for Data Transfer and Processing in MR Tomography. *International Transaction on Computer Science and Engineering*, ISSN 1738-6438, 2005, vol. 13, no. 1, pp. 39 - 48.

Bachelor's Programme

Safety in Electrical Engineering (Pavel Kaláb)	Electrical Engineering 2 (Jiří Sedláček)
Seminar of Electrical Engineering (Jarmila Dědková)	Measurement in Electroengineering (Karel Bartušek)
Electrical Engineering 1 (Jiří Sedláček)	The C++ Programming Language (Pavel Fiala)

Master's Programme

Electrical Installations (Pavel Kaláb)	Modelling of EM Fields (Jarmila Dědková)

Doctoral Programme

Magnetic Measurement and Technical Applications (Jiří Rez)	Computer Methods of Filter Design and Optimization (Jiří Sedláček)
Measurement Methods in NMR (Karel Bartušek)	Field Computation in Power Engineering (Libor Dědek)

Laboratories

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

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

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

Computer Laboratory (exercises in Computers and Programming 2, Miloslav Steinbauer)

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

Research Laboratory of Electric Circuits (research laboratory for doctoral students, Jiří Sedláček)

Research Laboratory of Electro-Optics (research of electro-optic measurement methods, Eva Kadlecová)

Research Laboratory of Magnetic Measurement (Jiří Rez)

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

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

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

Research Laboratory of Optoelectronic Systems (research of optoelectronic methods of measurement and numeric modelling, Eva Kadlecová)

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

Research Laboratory of Light Technology (measuring of light source parameters, Eva Kadlecová)

Department of Power Electrical and Electronic Engineering

Doc. Ing. Čestmír Ondrůšek, CSc.
Head

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Professors
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Prof. Ing. Vítězslav Hájek, CSc.
Prof. Ing. Karel Hruška, DrSc.
Prof. Ing. Jiří Skalický, CSc.

Associate Professors
Doc. Ing. Bohuslav Bušov, CSc.
Doc. Ing. Josef Koláčný, CSc.
Doc. Dr. Ing. Hana Kuchyňková
Doc. Ing. Josef Lapčík, CSc.
Doc. Ing. Čestmír Ondrůšek, CSc.
Doc. Dr. Ing. Miroslav Patočka,
Doc. Ing. Zdeněk Vávra, CSc.
Doc. Ing. 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, Ing. Salem S. 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, Ing. Pavel Štorek, Ing. Radek Trávníček, Ing. Zdeněk Tulis, Ing. Ferdinand Urban, Ing. Jiří Valenta, Ing. Ondřej Vítek, Ing. Miroslav Zemánek, Ing. Jakub Žajdlík

Administrative and Technical Staff
Ing. Josef Bartl, CSc., Josef Daněk, Ing. Petr Dohnal, Ing. Zdeněk Feiler, Ph.D., Zdeněk Koráb, Alena Šmídová

Main Interests

The department provided tuition in a general subject in the first year of the new Bachelor's degree programme and in specialist subjects in the area of Power Electrical and Electronic Engineering in the ending and in the new Bachelor's programme and the ending Master's programme. Instruction is provided in subjects in the area of electric machines, devices, drives, power and control electronics.

Research is centred on basic research of theoretical modelling of radiation energy transport in thermal plasma. Applied research is focused on electric low-voltage machines for automotive industry, optimization and identification of parameters of electric machines using artificial intelligence and development of special machines such as startergenerators, controlled magnetic bearings and levitation systems. The department was also involved in research of electrical energy converters of extreme parameters, utilization of ultracapacitors in cooperation of electronic converters, accumulators and electric machines in electric traction. The department had cooperation with a number of universities, e.g. Technical University of Gliwice, RWTH Aachen and industrial companies, e.g. Siemens Elektromotory Drásov, Magneton Kroměříž, OEZ Letohrad.

In 2006 basic research will continue in computation of energy transmission by radiation in air plasma. Research and development of a microgenerator for aircraft industry will be conducted within the framework of the 6th framework programme as well as optimization of the design of asynchronous and synchronous machines by means of artificial intelligence methods, controlled magnetic bearings, special electronic converters and utilization of ultracapacitors in electric traction.

Major Achievements

Development of a unique apparatus for contactless measurement of commutator surface in electric machines. Evaluation tests verified not only conventional constructions, but also special (carbon) commutators with radial and axial construction.

The department implemented and introduced in operation an Active magnetic levitation system with loading capacity m = 200kg and air gaps l = 5mm. It is a system similar to that used in fast trains TRANSRAPID.

The latest technologies were used to develop, manufacture and test (for mechanical parameters) a sample of ceramic commutator. The company KOMUTEX, s.r.o. expressed interest in cooperation.

Developed and constructed were unique engines for the drive of heart pump including actively controlled magnetic bearings.

Within the framework of cooperation with TH Ilmenau, specimens of innovated friction points were manufactured and provided to the partner for testing. Results were obtained of measurements of the commutation properties of tested machines of the first series.

An extensive pilot Leonardo da Vinci project ´Unified Interactive System of Electronic Instruction in Electrical Engineering´ was completed by 31 August 2005.

Since 1 January 2005, an international European project under the 6th Framework development programme has been carried out. In cooperation with UTEE, research of a microgenerator for wireless supply of sensors has been underway. Two operating samples have been manufactured and tested.

The department hosted two international conferences: ´XVIth Symposium on Physics of Switching Arc´ and ´3rd Conference on Low Voltage Electrical Machines´.

Major Research Projects

High-Power Alternator for Motor Vehicles Focused on Agricultural and Special Machinery – MPO FD-K3/102
Investigator: Vítězslav Hájek

Electrical Pumping Device for NC Working Machines – MPO FF-P/094
Investigator: Vítězslav Hájek

Empiric Models for Multiparametric Evaluation of Quality Parameters – GACR 102/03/P124
Investigator: Josef Bradík

Innovation of DC Motors with Gear Used in Electric Systems of Vehicles – MPO FD-K3/044
Investigator: Vítězslav Hájek

Converter Control in Electric Drives for Ecological Transport Systems – GACR 102/03/D222
Investigator: Bohumil Klíma

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

Development of High-Voltage Disconnect Switches – MPO FI-IM/158
Investigator: Zdeněk Vávra

Enhancement of Selected Parameters of Electrical Low-Voltage Machines – GACR 102/03/0813
Investigator: Vítězslav Hájek

Selected Publications

JENIŠTA, J., BARTLOVÁ, M., AUBRECHT, V. Radiation in water-vortex stabilized electric arc – comparison among different models. *High Temperature Material Processes: An International Journal*, ISSN 1093-3611, 2005, vol. 8, no. 2, pp. 195 - 205.

Bachelor's Programme

Automotive Electric and Electronic Systems (Vítězslav Hájek)

Electrical Drives (Josef Koláčný)

Electrical Machines (Čestmír Ondrůšek)

Inspection and Control (František Veselka)

Microprocessor Technology for Drives (Miroslav Patočka)

Design of Electrical Drives (Jiří Skalický)

Computational Visualization and Animation (Hana Kuchyňková)

Computer-Aided Design (Hana Kuchyňková)

Computer Science in High Power Engineering (Vladimír Aubrecht)

Control Electronics (Miroslav Patočka)

Control Theory (Jiří Skalický)

Power Electronics (Jaromír Vrba)

Master's Programme

Adaptive and Optimal Control of Drives (Jiří Skalický)

Automotive Electric and Electronic Systems (Vítězslav Hájek)

Dynamics of EM Systems (Čestmír Ondrůšek)

Electromechanical Systems (Čestmír Ondrůšek)

Electrical Components of Vehicles (Vítězslav Hájek)

Electrical Microdrives (Josef Koláčný)

Electrical Drives I (Josef Koláčný)

Electrical Drives II (Jiří Skalický)

Electric Apparatus (Zdeněk Vávra)

Electric Control of Drives (Jiří Skalický)

Electric Stations (Zdeněk Vávra)

Electrical Machines for Motor Vehicles (Vítězslav Hájek)

Plasma Physics and Diagnostics (Vladimír Aubrecht)

Electrotechnical Inspection and Supervision (František Veselka)

Protection Electric Devices (Jaromír Vaněk)

Laboratory of Electric Machines and Devices (František Veselka)

Measurement In Heavy Current Engineering (Vítězslav Hájek)

Microprocessor Control of Electric Drives (Jiří Skalický)

Microprocessor Technology (Miroslav Patočka)

Micromachines (Vítězslav Hájek)

Design of Electrical Drives (Jiří Skalický)

Non-Destructive Diagnostics and Monitoring (Karel Hruška)

Computer-Aided Design (Hana Kuchyňková)

Computer Modelling in Power Engineering (Hana Kuchyňková)

Industrial Electronic Machines and Devices (Pavel Vorel)

Control Element s of Electric Drives in Heavy-Current Engineering (Zdeněk Feiler)

Control Elements in Electric Drives (Pavel Vorel)

Regulation and Quality Control (Karel Hruška)

Dynamic Systems Control (Petr Huták)

Quality Assurance and Metrology (Karel Hruška)

Special Testing of Electrical Apparatus (František Veselka)

Construction of Electrical Machines and Devices (Zdeněk Vávra)

Alternating Control Drives (Jiří Skalický)

Technical Requirements on Production Evaluation (Karel Hruška)

Power Converter Technology (Miroslav Patočka)

Innovative Problem Solving - TRIZ (Bohuslav Bušov)

Power Electronics II (Miroslav Patočka)

Power Electronics II I(Miroslav Patočka)

Manufacturing of Electrical Machines and Devices (František Veselka)

International Cooperation in Quality Assurance (Karel Hruška)

Fundamentals of Logistics and Management (Bohumil Klíma)

Principles of Power Electronics (Miroslav Patočka)

Low-Voltage Installations and Protection (Jaromír Vaněk)

Doctoral Programme

Topical Conditions of Testing and Certification in CR and EU (Karel Hruška)

Automatic Measurement of Electric Machines (Vítězslav Hájek)

Electric Microdrives (Josef Koláčný)

Electrical Machines for Motor Vehicles (Vítězslav Hájek)

Electromechanics (Čestmír Ondrůšek)

Advanced Control of Electrical Drives (Jiří Skalický)

Optical Plasma Diagnostics (Vladimír Aubrecht)

Theory of Inventive Problem Solving (Bohuslav Bušov)

Power Electronics (Miroslav Patočka)

Power Electromechanical Systems (Miroslav Patočka)

Laboratories

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

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

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

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

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

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

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

Laboratory of Mechatronics (Čestmír Ondrůšek)

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

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

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

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

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

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