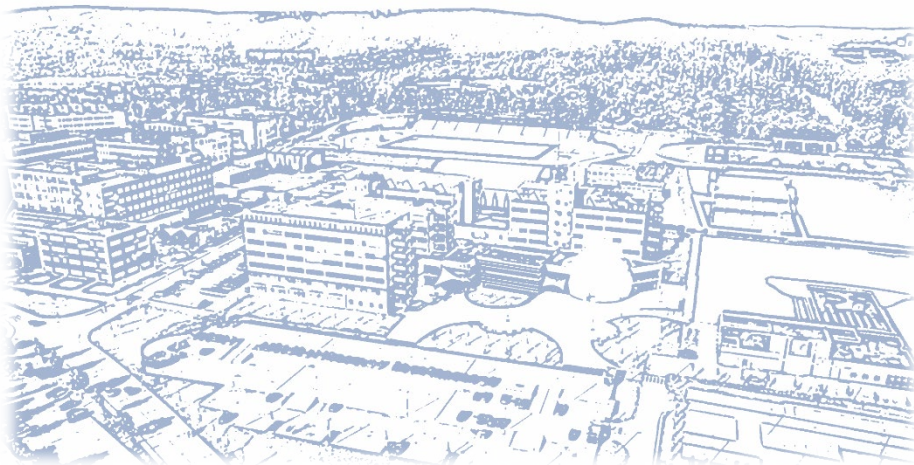# Annual Report 2016

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

Electrotechnical disciplines were first taught at the university in 1905. Since the Faculty of Power Engineering was founded in 1959, and subsequently transformed into Electrotechnical Faculty, more than 26,000 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) and was the third largest amongthe then existing seven faculties of Brno University of Technology 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 in 2001 in connection with the founding of a new faculty in 2002 - 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). A significant milestone in the faculty history was the year 2013 when construction of new faculty premises was completed. After more than fifty years of its existence, the whole faculty, all departments and workplaces, moved to one locationin the BUT campus Pod Palackého vrchem.

The Faculty in 2016

The Rector was Professor Petr Štěpánek and his Vice-Rector for Creative Activities was Professor Lubomír Grmela from the Department of Physics, Faculty of Electrical Engineering and Communciation.

The Dean of FEEC in 2016 was Professor Jarmila Dědková, and the four vice-deans were Professor Vladimír Aubrecht (research and doctoral study programme, acting dean), Associate Professor Jiří Háze (external relations and international affairs), Associate Professor Petr Fiedler (Bachelor study programme), Professor Stanislav Hanus (Master study programme), and Miloslav Morda was faculty bursar.

At the end of 2016 there were 217.4 academic loads at the faculty (professors, associate professors, senior lecturers, lecturers and other pedagogical and research staff) and 3,678 students in all forms of government supported programmes. Moreover, inter-faculty instruction was provided to 230 students of the Faculty of Information Technology, 33 students of the Faculty of Mechanical Engineering, 78 students of the Faculty of Management and 4 students from Institute of Forensic Engineering.

On the other hand, the faculty purchased instruction for 8 students from the Faculty of Management and for 4 students fromthe Faculty of Information Technology. Then the number of students educated at the faculty totalled 3, 770. In 2016 education was provided in study programmes Electrical Engineering, Electronics, Communication and Control Technology (EECR, accredited in 2001) and Biomedical Technology and Bioinformatics (BTBIO-A, reaccredited in 2013), Biomedical Engineering and Bioinformatics (BTBIO-F, accredited in 2010), English in Electrical Engineering and Information Technology (AJEI-H, accredited in 2012) and Audio Engineering (AUDIO, accredited in 2012) in the Bologna system.The study programmes at FEEC are now fully compatible with the European education system, and student mobility has been facilitated. Among the FEEC graduates in 2016 there were 415 students who completed the Bachelor degree programme, 403 follow-up Master programme graduates and 29 doctoral students completed the Ph.D. programme. There were 1,238 admissions to Bachelor programmes, 596 admissions to follow-up Master programmes, and 83 students started their Ph.D. studies. Instruction in English was provided to 2 international students paying their fees. One academic received the title of professor and eight academics were appointed associate professors.

Events and Activities

- operationof the interactive playroom 'Elektrikárium'
- awarding of the QMS (ISO 9001) certificate
- Open Days (January, November, December 2016), visits by students to secondary schools, secondary school advisors visiting FEEC, 'Night of Scientists'
- faculty presentation at European trade fair of higher and lifelong education 'GAUDEAMUS 2016, 1-4 November 2016', trade fairs in Bratislava, Nitra and Prague
- development of programmes leading to habilitation and appointment of professors
- meeting of the leaderships of Czech and Slovak faculties of electrical engineering and associated facultiesin Nové Město na Moravě, 17-19 May 2016
- '22 STUDENT EEICT Conference and Competition 2016' with 35 Bachelor, 52 Master, 102 Ph.D. and 5 papers by secondary school students, sponsored by Honeywell, ABB, ON Semiconductor etc.
- creative competition for secondary school students 'Merkur perFEKT Challenge' with more than 200 participants from all parts of the Czech Republic
- Programme Erasmus+ and other European programmes
- continuation of the project 'Energy in Conditions of Sustainable Development (EN-PUR)' of the regional centre CVVOZE (Centre for Renewable Electric Energy Sources) funded from NPU I, investigator Vladimír Aubrecht
- continuation of the project 'Interdisciplinary Research of Wireless Technologies' (INWITE) of the regional centre SIX (Centre for Sensor, Information and Communication Systems) funded from NPU I, investigator Martin Slanina
- operation of the mini nursery'Edisonka' supported by BUT faculties
- activities of Academic Senate member Ivana Jakubová in her capacity as a member of the Higher Education Council
- activities of Academic Senate, namely Chairman Miloslav Steinbauer, focused on organisationalissues and economic interests of FEEC
- courses for secondary school students interested in study at FEEC organised by Department of Mathematics to help them prepare for entrance examination and 'Summer School of Electrical Engineering'organised by Department of Theoretical and Experimental Electrical Engineering
- activities of Advisor for Equal Opportunities Vlasta Sedláková focused on consultancy for female students and study opportunities for handicapped students
- faculty ball at the Voroněž hotel

Achievements

Economic situation of the faculty in 2016 was satisfactory.It can be said that income for education slightly increased, however, higher write-offshad to be covered from allocated funds. Research and development institutional support substantially increased. The trend in salaries and material supply was favourable due to outstanding pedagogical and research achievements of academic staff and minimisation of faculty expenditure. The funds received for project solutionhave slightly decreased. The balance for 2016 that can be used to finance faculty activities only to a limited extent was transferred to wages and salaries to be paid as an extra pay at the end of theyear. Faculty funds are generated and used to support faculty development and provide funding for research projectswhen necessary.

Economic stability of departments was mainly due to involvement in research projects of the Czech Science Foundation, Czech Technology Agency, Ministry of Trade and Industry, European Commission (FP7), and efforts of those who under the leadership of chief investigators participated in OP VK, EN-PUR, INWITE and NPU projects. For three subsequent years income from economic activity has been rising, owing to the results of the centre CVVOZE.Also in 2016 the faculty achieved positive economic result that will be used tofinance faculty activites in the following period.

All staff members and Ph.D. students deserve high appreciation and my gratitude.

Jarmila Dědková
Dean

The Dean,vice-deans and faculty bursar

Faculty of Electrical Engineering and Communication

Dean

Prof. Ing. Jarmila Dědková, CSc.

Vice-Deans

Prof. RNDr. Vladimír Aubrecht, CSc.

Acting Dean, Vice-Dean for Creative Activities and Doctoral Degree Programme

doc. Ing. Petr Fiedler, Ph.D.
Vice-Dean for Bachelor Degree Programme

Prof. Ing. Stanislav Hanus, CSc.
Vice-Dean for Master Degree Programme
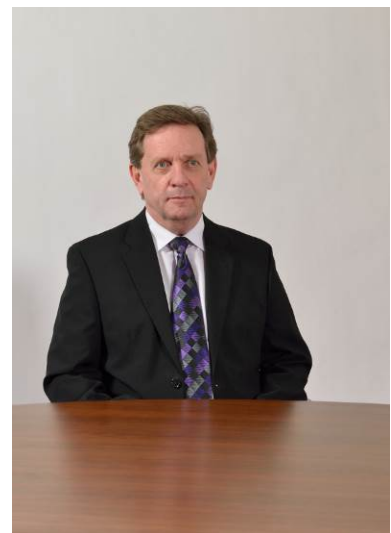
doc. Ing. Jiří Háze, Ph.D.
Vice-Dean for External Relations and International Affairs

Chairman of Academic Senate

doc. Ing. Miloslav Steinbauer, Ph.D.

Faculty Bursar

Ing. Miloslav Morda

Student Advisor to the Dean

Bc. Daniel Janík

Advisor for Equal Opportunities

doc. Ing. Vlasta Sedláková, Ph.D.

Trade Unions Representative

Prof. Ing. Vítězslav Hájek, CSc.

Departments

Department of Control and Instrumentation

Department of Biomedical Egineering

Department of Electrical Power Engineering

Department of Electrical and Electronic Technology

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. RNDr. Vladimír Aubrecht, CSc.

Prof. Ing. Lubomír Brančík, CSc.

Prof. Ing. Jarmila Dědková, CSc.

doc. Ing. Petr Fiedler, Ph.D.

Prof. Ing. Eva Gescheidtová, CSc.

Prof. Ing. Lubomír Grmela, CSc.

Prof. Ing. Stanislav Hanus, CSc.

doc. Ing. Jiří Háze, Ph.D.

Prof. RNDr. Jan Chvalina, DrSc.

Prof. Ing. Jiří Kazelle, CSc.

Prof. Ing. Vladislav Musil, CSc.

doc. Ing. Vít Novotný, Ph.D.

doc. Dr. Ing. Miroslav Patočka

Prof. Ing. Ivo Provazník, Ph.D.

Prof. Dr. Ing. Zbyněk Raida

Prof. Ing. Zdeněk Smékal, CSc.

doc. Ing. Petr Toman, Ph.D.

Prof. Ing. Pavel Václavek, Ph.D.

Prof. Ing. Radimír Vrba, CSc.

doc. Ing. Jaroslav Zendulka, CSc.

External members

doc. Ing. Otto Dostál, CSc.

doc. Ing. Ladislav Dušek, CSc.

Ing. Leoš Dvořák

Ing. Jiří Holoubek

doc. Dr. Ing. Pavel Horský

Prof. Ing. Miroslav Husák, CSc.

Prof. Dr. Ing. Josef Lazar

doc. Ing. Jiří Masopust, CSc.

Ing. Petra Peterková, Ph.D.

Ing. Jiří Potěšil

Prof. Ing. Aleš Richter, CSc.

Ing. Roman Schiffer

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Facebook:http://www.facebook.com/FEKTVUT

Youtube: http://www.youtube.com/user/perFEKTniFakulta

Accredited Study Programmes and Specialisations

Accredited Study Programmes

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

Electronics and Communications

Microelectronics and Technology

Power Electrical and Electronic Engineering

Teleinformatics

Bachelor Degree Programme Biomedical Technology and Bioinformatics
Study area: Biomedical Technology and Bioinformatics

Bachelor Degree Programme English in Electrical Engineering and Information Technology
Study area: English in Electrical Engineering and Information Technology

Bachelor Degree Programme Audio Engineering
Study area: Audio Engineering

Bachelor Degree Programme Information Safety
Study area: Information Safety

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

Power Electrical Engineering

Electronics and Communications

Electrotechnical Manufacturing and Management

Cybernetics, Control and Measurement

Microelectronics

Power Electrical Engineering and Power Electronics

Telecommunications and Information Technology

Follow-up Master Degree Programme Biomedical Engineering and Bioinformatics
Study area: Biomedical Engineering and Bioinformatics

Follow-up Master Degree ProgrammeAudio Engineering
Study area: Audio Engineering

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

Electronics and Communications

Physical Electronics and Nanotechnology

Cybernetics, Control and Measurement

Mathematics in Electrical Engineering

Microelectronics and Technology

Power Electrical and Electronic Engineering

Teleinformatics

Theoretical Electrical Engineering

Doctoral Degree Programme Biomedical Technology and Bioinformatics
Study areas: Biomedical Technology and Bioinformatics

Accredited Study Areas for Habilitation and Appointment to Professorship

Biomedical Engineering

Electronics and Communications

Electrical and Electronic Technology

Power Electrical Engineering

Technical Cybernetics

Teleinformatics

Theoretical Electrical Engineering

The faculty cooperates with elementary and secondary schools
Pupils at elementary school Novolíšeňská learn about basic electronic components

We appreciate cooperation with students.
The Dean and vice-deans withmembers of the club 'Students for Students'

Study Programmes

Bachelor Degree Programme Electrical, Electronic, Communication and Control Technology

The faculty has been providing education in the Bachelor programme Electrical, Electronic, Communication and Control Technology (EECR) in full-time form of study since academic year 2002/03 and in part-time form of study since academic year 2004/05.

In 2016 1,238 full-time students enrolled in the Bachelor programme EECR-B. The programme was completed by 311 full-time students, 56 of them in the study area Automation and Measurement Technology (B-AMT), 51 in Electronics and Communications (B-EST), 41 in Microelectronics and Technology (B-MET), 80 in Power Electrical and Electronic Engineering (B-SEE) and 83 in Teleinformatics (B-TLI).

In the part-time Bachelor programme EECR-BK there were 163 students. The programme was completed by 16 students, 2 of them in Automation and Measurement Technology (BK-AMT), 6 in Electronics and Communications (BK-EST), 4 in Power Electrical and Electronic Engineering (BK-SEE) and 2 in Teleinformatics (BK-TLI).

Applications for full-time and part-time Bachelor study were accepted. There was a written entrance test in either mathematics and physics, or mathematics and the basics of informatics. Students who met one of the following requirements were exemptfrom examination:

- passed their school-leaving examination in mathematics or physics with grade 1 or 2 in at least one of these subjects
- completed a preparatory course in mathematics or physics with grade 1 or 2
- achieved a secondary-school average better than 2.0 (arithmetical average of grades in final reports for 1st, 2nd and 3rd year and the first half of 4th year)
- passed National Comparative Examinations and Test of General Study Prerequisites with a minimum of 60% in all assessed parts
- passed National Comparative Examinations and in mathematics achieved a minimum of 60% in each part of the test

The maximum number of points to be achieved in entrance examination for each subject was 50 and the pass was 12 for each subject. All applicants who passed entrance examination or who were exempt from it were admitted.

In 2016 there were 1, 067 applicants, 941 for full-time study and 126 for part-time study. Finally, 709 students were admitted, 635 in full-time study and 74 in part-time study. As the number of admitted students did not reach full capacity, a second term was announced. There were 109 applications for full-time study and 20applications for part-time study. The total number of students enrolled was 645, 568 full-time students and 77 part-time students.It can be said that part-time study remains in the focus of interest. Numbers of applicants in Table1 indicate declining interest in technical programmes. Table 2 shows numbers of students interested in individual specialitsations over the period 2012/13 - 2016/17.

Preparatory courses are offered by the Department of Mathematics and Department of Physics to assist applicants preparing for entrance examinations and help them adapt to university studies. Information on study programmes and qualifications such as Certificate of Electrotechnical Qualification, Certificate of Pedagogical Practice, Microsoft Certificate, Cisco Certificate are regularly presented in the media, on Open Days, visits by teachers and students to secondary schools, and at the GAUDEAMUS fair. All activities are focused on promotion of FEEC and increasing the interest in studies at FEEC.

Table 1: Interest of full-time students in Bachelor study areas - Automation and Measurement (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*	*total*
2012/13	Numbers	149	112	75	171	192	
	%	21,3	16,0	10,7	24,5	27,5	699
2013/14	Numbers	121	111	73	153	200	
		18,4	16,9	11,1	23,3	30,4	658
2014/15	Numbers	125	70	90	119	186	
	%	21,2	11,9	15,3	20,2	31,6	590
2015/16	Numbers	148	80	97	129	167	
		23,8	12,9	15,6	20,8	26,9	621
2016/17	Numbers	148	61	79	139	141	
	%	21,2	11,5	15,2	20,5	31,5	568

Bachelor Degree Programme Biomedical Technology and Bioinformatics

In academic year 2007/08 the Bachelor programme Biomedical Technology and Bioinformatics (BTBIO-A) was launched. The full-time form of study covers one study area Biomedical Technology and Bioinformatics (A-BTB). Instruction in this interdisciplinary programme is also provided by the Faculty of Medicine, Masaryk University in Brno.

The study area Biomedical Technology and Bioinformatics is mainly focused on practical training, but it also prepares graduates for further studies in follow-up Master programmes at universities providing education in biomedical engineering, medical informatics and mathematical biology (Brno University of Technology, Czech Technical University in Prague, Charles University, Masaryk University). Students gain theoretical knowledge in mathematics, physics and chemistry, basic knowledge in biology, human anatomy and physiology, needed to understand the basic biological processes taking place in humanorganism and to communicate with doctors and medical staff. They get acquainted with operation principles and use of medical technology and informatics, and gain ability to work with them. Moreover, they are offered information on medical legislative and learn how to apply it in practice. Emphasis is laid on general and professional language skills. The Bachelor programme includes a four-week professional training in hospitals, health centres, institutions and companies focused on running clinics, treatment, research and trade in biomedical technology and bioinformatics in the Czech Republic and abroad. The training is arranged by the students themselves and takes place outside scheduled instruction (mainly during the summer holidays) by the time of completion of the Bachelor programme.

The top limit approved by Academic Senate for admission to full-time study in the programme BTBIO-Awas 150. Applicants with secondary-school grade average of 1.25 were exempt from entrance examination. The maximum number of points to be achieved in each subject was 50 and the pass was 12 points for each subject. All applicants exempt from entrance examination and those who passed the examination with excellent results were admitted. In 2016 there were 170 paid applications, 107 admissions and 77 enrolled. And there were 204 full-time students in the BTBIO-A programme.

Bachelor Degree Programme English in Electrical Engineering and Information Technology

The Bachelor programme English in Electrical Enginering and Information Technology (AJEI-H) with the study area English in Electrical Engineering and Information Technology (H-AEI) was launchedin academic year 2012/13. English in Electrical Engineering and Information Technology as a specific professional variety had not been taught before at universities in the Czech Republic though English is the lingua franca of engineering specialisations. The programme also includes cultural studies and fundamentals of electrical engineering and economics. The graduates will be equipped for work in industrial companies, government administration, research institutions, management, and translating of technical texts. They will acquire basic knowledge of electrical engineering and professional language competences on level C1 of the 'Common European Reference Framework'.

The subjects selected for entrance examination are mathematics and English. The entrance examination contained an English language test (multiple choice) at the intermediate level B1 of the 'Common European Reference

Framework'. Exempt from the examination in English were students who submitted a certificate or report confirming the required level of knowledge B2 of the 'Common European Reference Framework' (Upper-Intermediate).

Students who met one of the following requirements were exempt from examination in mathematics:

- passed their school-leaving examination in mathematics with grade 1 or 2
- completed a preparatory course in mathematics with grade 1 or 2
- achieved a secondary-school average better than 1.70 (arithmetical average of grades in final reports for 1st, 2nd and 3rd year and the first half of 4th year)
- passed National Comparative Examinationsand reached 60.0% in each part of the test in mathematics

The maximum number of points to be achieved in entrance examination for each subject was 50 and the pass was 12 for each subject. All applicants who passed the entrance examination or who were exempt from it were admitted. There were 120 applicants for academic year 2016/2017, 85 of them were admitted and 75 enrolled.

Bachelor Degree Programme Audio Engineering

Since academic year 2013/14 a new full-time Bachelor programme Audio Engineering (AUDIO-J) with one study area Audio Engineering (J-AUD) has been offered. The programme provides interdisciplinary Bachelor education in audio engineering and is focused on training of audio engineers with technical and artistic approach to the latest audio technology, audio signal processing, musical production and studio practice. The programme was prepared and implemented in cooperation with Janáček Academy of Music and Performing Arts, Faculty of Music.

Applicants for admission to the study programme AUDIO-J are required to take an aptitude test and entrance examination in mathematics and physics or mathematics and basics of informatics. The aptitude test is taken prior to entrance examination. Decisive for admission are results of aptitude test. The requirement for entrance examination is to achieve the given minimum number of points. The aptitude test is obligatory. Exempt from entrance examination are applicants who achieved a secondary-school average 1.25 (an arithmetical average of grades in final reports for 1st, 2nd and 3rd year and the first half of the fourth year). There were 131 applicants, 74 admissions and 67 enrolled.

Bachelor Degree Programme Information Safety

A full-time Bachelor programme Information Safety (IBEP-T) was launched in 2015/16 and in the current academic year it is followed by a part-time programme (IBEP-TZ), both of them offering one study area Information safety (T-IBP, TZ-IBP). The programme provides training for a Bachelor degree in information and communication safety (ICT). It is focused on education of experts in safety of information and communication technologies (ICT), and legal and economic aspects connected with safety issues. The programme was designed and is implemented in cooperation with Faculty of Law, Masaryk University.

Entrance examination contains an optional combination of mathematics and physics or mathematics and fundamentals of informatics. Exempt from entrance examination are applicants who achieved a secondary-school average1.50 (an arithmetical average of grades in final reports for 1st, 2nd and 3rd year and the first half of the fourth year).

In 2016 there were 235 applicants, 107 admissions and 92 enrolled.

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

The follow-up Master programme Electrical, Electronic, Communication and Control Technology in full-time form of study has been offered since academic year 2005/06 and in part-time form of study since academic year 2007/08.

In academic year 2016 there were 750 students in the EECR-M programme, 361 in the first year of study and 389 in the second year,there were 166 students in the part-time programme EECR-ML, 86 of them in the first year of study and 80 in the second year.

The full-time programme was completed by 308students,10 of them in Biomedical and Ecological Engineering (M-BEI),25 in Power Electrical Engineering (M-EEN), 43 in Electronics and Communications (M-EST), 28 in Electrotechnical Manufacturing and Management (M-EVM), 64 in Cybernetics, Control and Measurement (M-KAM), 36 in Microelectronics (M-MEL), 38 in Power Electrical and Electronic Engineering (M-SVE) and 64 in Telecommunications and Informatics (M-TIT). Part-time study was completed by 43 students, 1 in Biomedical and Ecological Engineering (ML-BEI),1 in Power Electrical Engineering (ML-EEN), 2 in Electronics and Communications (ML-EST), 10 in Electrotechnical Manufacturing and Management (ML EVM), 2 in Cybernetics, Control and Measurement (ML-KAM), 8 in Microelectronics (ML-MEL), 4 in Power Electrical and Electronic Engineering (ML-SVE) and 15 in Telecommunications and Informatics (ML-TIT).

The total number of paid applications for the EECR programme was 607, 469 for full-time study (EECR-M) and 138 for part-time study (EECR-ML).For academic year 2016/17 the maximum numbers of admissions approved by Academic Senate were 750 (full-time study) and 250 (part-time study). Written entrance examination contained

10 tasks, two for each of the five subjects approved by the Study Programmes Council - Electrotechnical Engineering 1, Electrotechnical Engineering 2, Electronic Components, Signals, Structures, Systems and Measurement in Electrical Engineering. The number of points to be achieved for each problem was 10, total of 100 points. The time limit was 75 minutes. As the number of applicants was lower than the number approved for admission, the Dean decided, in accordance with Admission Procedure Rules, about exemption from entrance examination and admission of all applicants. On announced entrance examination date 23 June 2016 nearly all applicants enrolled. The second examination term 7 July2016 and Committee meeting scheduled for 17 August 2016 were cancelled. There were 508 applicants, 398 for full-time study and 110 for part-time of study. All admitted were registered for the study areas they had selected. Numbers of applicants and admitted by study areas are in Table 2. The total number of enrolled is 480, 382 in full-time study and 98 in part-time study.

Follow-up Master Degree Programme Biomedical Engineering and Bioinformatics

Since academic year 2010/11 education has been provided in the follow-up Master programme Biomedical Engineering and Bioinformatics BTBIO-F. In 2016 there were 76 students in this full-time programme, 26 of them in the first year of study and 50 in the second year. The programme BTBIO-F was completed by 52 students.

The total number of applicants (with paid application) for BTBIO-F was 56. The number of admissions approved by Academic Senate for full-time study in 2015/16 was 250. The written examination contained 10 problems selected from two topic areas published on faculty websites. The topic areas were approved by the Study Programmes Council. Every correct result yielded 10 points, max. 100 for the whole examination. The time limit was 75 minutes. As the number of applicants was lower than the number approved for admission, the Dean decided, in accordance with Admission Procedure Rules, about exemption from entrance examination. On announced entrance examination date 23 June 2016 nearly all applicants enrolled. The second entrance examination term 7 July 2016 and Committee meeting scheduled for 17 August 2016 were cancelled. There were 35 admissions and 35 enrolled.

Follow-up Master degree programmeAudio Engineering

The full-time follow-up Master programme Audio Engineering AUDIO-P was launched in academic year 2016/17 and in 2016 there were25 students in the first year of study.

Thirty-one applicant sent in a paid appllication for study in the programme AUDIO-P. The number of admissions approved by Academic Senate for academic year 2016/17 was 40. Entrance examination contained an aptitude listening test, written examination and interview focused on evaluation of applicant's own musical recording.

The aptitude test lasted 25 minutes and included a hearing ability test centred on space perception, sound colour intonation and rhythm analysis and a genre and style test to assess the ability to distinguishaesthetic musical parameters. The maximum number of points was 50.

The written examination lasted 50 minutes and contained 5 tasks selected from 5 areas of topics involving acoustics, electroacoustics analog, low-frequency techniques, digital processing of sound signals and sound technology. The topics werepublished on faculty websites. The maximum number of points to be attained for written examination was 50. The topic areas were issued by the Study Programmes Council. They were equally difficult and kept secure until the examination started.

In the interview the applicant's recording of the required length and format was analysed. The applicant presented CD files with sound tracks of his/her own recording of an ensemble playing several instruments chosen by the applicant. The CD also contained a file with the resulting sterephonic recording (master) and a PDF document describing the used technique, location of microphones, recording, mixing and the process of creating the master recording. For this recording and its defence the applicant could earn 50 points.

The second entrance examination term was scheduled for 7 July 2016 and Committee meeting for 17 August 2016. There were 25 admissions and 25 enrolled.

Lifelong Education and Self-Paid Study

The faculty participates in the system of lifelong education (Amendment to Act 111/98 Coll. on tertiary education). Apart from a range of specialised courses for professionals, the faculty offers paid study of subjects in the Bachelor and the follow-up Master programme EECR. Having completed the courses, the graduates will be admitted in a study programme without being required to pass entrance examination, and earned credits will be recognised. In 2016 there were 9 students in the lifelong education programme.

Table 2: Applicants and admissions to study areas of follow-up Master programmes EECR-M and EECR-MLin2016: Biomedical and Ecological Engineering(M-BEI, ML-BEI), Power Electrical Engineering (M-EEN, ML-EEN), Electronics and Communications (M-EST, ML-EST), Electrotechnical Manufacturing and Management (M-EVM, ML-EVM), Cybernetics, Automation and Measurement (M-KAM, ML-KAM), Microelectronics (M-MEL, ML-MEL), Power Electrical Engineeringand Power Electronics(M-SVE, ML-SVE), Telecommunications and Information Technology (M-TIT, ML-TIT)

Study area	Applicants	Admissions	Study area	Applicants	Admissions
M-BEI	44	29	ML-BEI	23	19
M-EEN	53	48	ML-EEN	16	14
M-EST	62	58	ML-EST	13	9
M-EVM	74	61	ML-EVM	20	19
M-KAM	68	54	ML-KAM	24	17
M-MEL	31	27	ML-MEL	15	12
M-SVE	44	38	ML-SVE	0	0
M-TIT	93	83	ML-TIT	27	20

Table 3: Numbers of Bachelor and Master students over 2012 - 2016

Programme	2012	2013	2014	2015	2016
EEKR-B	1868	1812	1716	1611	1401
BTBIO-A	285	263	230	218	204
AJEI-H	76	88	162	179	171
AUDIO-J	0	52	100	139	134
IBEP-T	0	0	0	52	123
Bc total	**2229**	**2215**	**2208**	**2199**	**2033**
EEKR-M	989	974	964	1002	916
BTBIO-F	115	118	137	108	76
AUDIO-P	0	0	0	0	25
Mgrtotal	1104	1092	1101	1110	1017
Total	3333	3307	3309	3309	3050

Instruction Support

There has been a consistent effort at the FEEC to improve and use more extensively the information system for management of study affairs and to make relevant information accessible to students. In 2016 regular assessment of the quality of teaching by students took place at the end of the winter and the summer semester using the BUT information system.

In support of instruction in full-time and part-time Bachelor and follow-up Master programmes innovated electronic texts (ET) and multimedia aids (MP) were created and published on faculty websites.

Science, Research and Doctoral Study

Creative Activities, Science and Research

Academics and students are involved in basic and applied research in most specilisations of electrical engineering.

Research and development at FEEC is supported by the Ministry of Education, Youth and Sports, Czech Republic, and receives funding from projects of the Czech Science Foundation etc. In the period 2011 - 2013 a major source of mainly investment funds was the Operational Programme 'Research and Development for Innovations' (OP VaVpI) for completion of two regional research centres CVVOZE and SIX.

Another sources of funding were projects of the Czech Science Foundation, Technology Agency of the Czech Republic, and two projects of National Sustainability Programme.

On international level, our researchers were involved in a number of projects, mainly for the programme Horizon 2020. The faculty prepares a number of other projects.

FEEC is also involved in applied research for industrial partners. Apart from cooperation projects, research on contract basis is increasing. Income from contracts in 2015 amounted to roughly 25 million CZK, with significant contribution of the regional research centres CVVOZE and SIX. Research is carried out on the basis of commercial contracts, and also as part of diploma theses and dissertations (specific research). All companies interested in cooperation with FEEC can contact us.

No significant project for education support was conducted in 2016. The total income from development programmes and institutional development plan was about 3.3 million CZK.

Original scientific and professional outcomes were published in three international monographs and 144 papers in impact scientific journals. The faculty was granted 8 national and 1 international patent or utility sample.

Financial support for R&D activities from selected resources (non - investment)
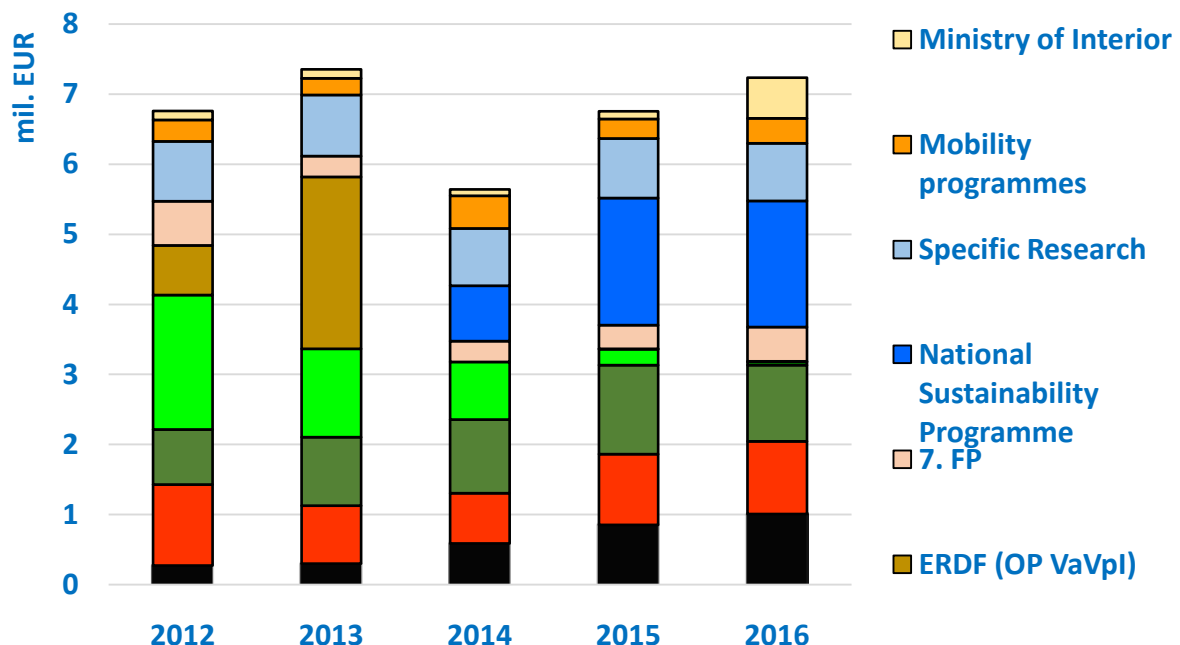
Graph1: Funding of research and development from 2012 to 2016.

Financial support of educational activities from selected resources
(non - investment)
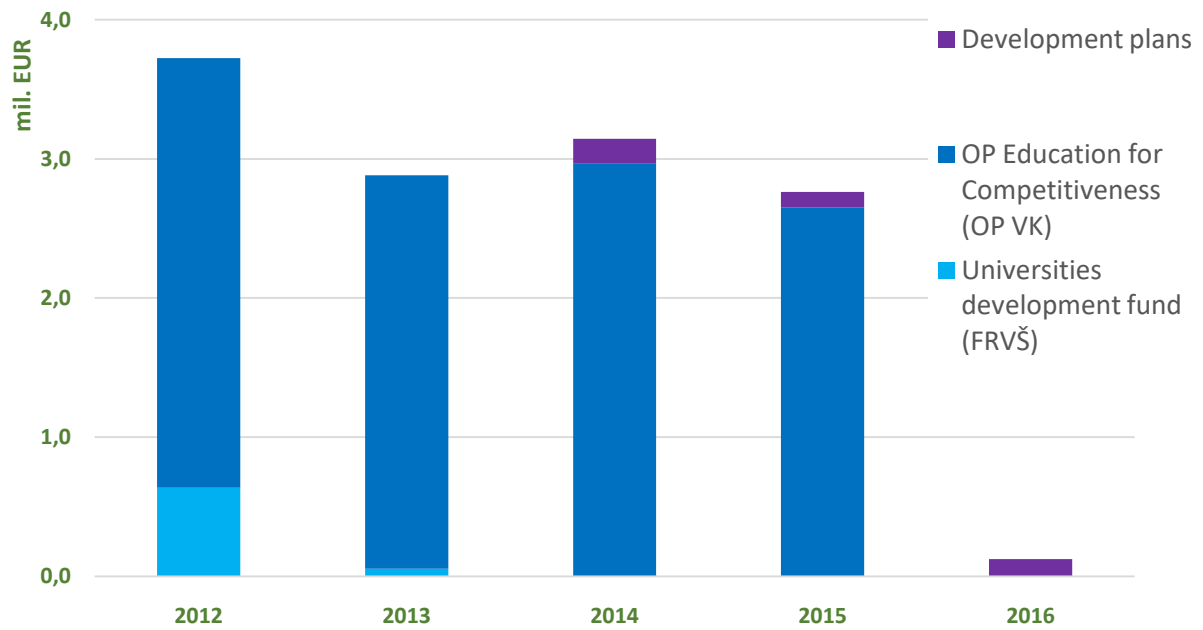
Graph 2: Funding ofeducationfrom 2012 to 2016

Outcomes from commercial contracts in 2016 (EUR)

SIX; 358 997

CVVOZE; 613 858

FEKT; 38 678

Graph 3: Income from contract research in 2016

Regional Research Centres

Two regional research centres continued their research and development activities.
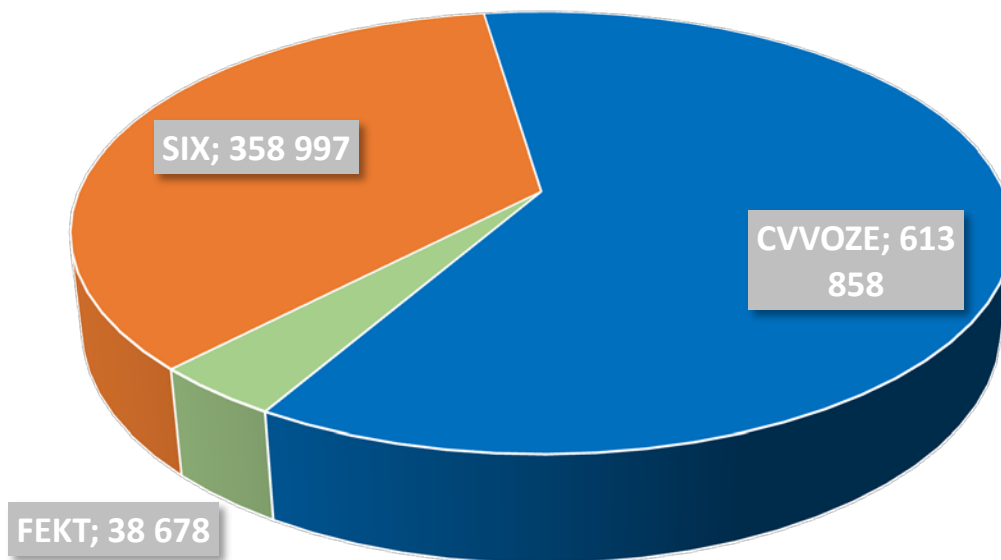
Centre of Research and Utilisation of Renewable Enery Sources(CVVOZE)

Prof. RNDr. Vladimír Aubrecht, CSc.

Director

The centre coordinates research, development and innovation capacities for research on renewable energy sources. The research team focuses on chemical and photovoltaic energy sources, electrochemistry, electromechanics, electrotechnology, electrical drives, power electrical engineering, mobile robots and industrial electronics. In 2016 CVVOZE focused on research in five research areas:

- optimisation of electrochemical energy conversion
- chemical and photovoltaic energy sources
- generation, transmission, distribution and utilisation of electrical energy
- automation and sensor technologies
- switch-off process in switching devices

The unique short circuit laboratory at CVVOZE

An important source of research funding in 2016 was the project of national Sustainability Programme 'Energy in Conditions of Sustainable Development (EN-PUR)'.

The centre's activities are focused on basic research, and on applications and acceleration of transfer of novel technologies into industrial use. All CVVOZE laboratories form a unique infrastructure that will undoubtedly attract important industrial partners whose areas of interest are closely connected with research carried out in the centre.

The leading workplaces are Laboratory of Switching Devices and Ultra High Voltage Laboratory located in Professor List Technology Park. These strategic laboratories are used for research and development of various power and high voltage electrical devices and systems. Equipment can be used to simulate extreme short-circuit grid conditions, lightning strike on lines etc. The unique laboratory equipment draws attention of many industrial companies. We have been offered contracts from SIEMENS, ABB, EATON, and from smaller Czech firms (DRIBO) and foreign companies (SEZ Krompachy - Slovakia, Techna Ltd. – Great Britain, Schaltbau - Austria). Research contracts for these laboratories in 2016 amounted to more than 9 mil. CZK.

For more information on CVVOZE visit www.cvvoze.cz.

Centre of Sensor, Information and Communication Systems (SIX)

doc. Ing. Martin Slanina, Ph.D.
Director

Research centre SIX was established in 2010 as a joint initiative of FEEC departments involved in research and development of sensor systems, information and communication technologies. The aim was to interconnect research interests and utilise achieved synergy in work on extensive and complex research projects.

The centre's own LTE network infrastructure

The involved departments offered their laboratories that were upgraded and extended in the period 2011 - 2013 owing to support from the operational programme 'Research and Development for Innovations'. In 2014 the centre started full operation without direct financial support from public sources. The centre grew, not only in terms of numbers of involved researchers and their loads, but also results, grants and commercial contracts. And the growth continued in 2015 and 2016.

Centre SIX is supported by the National Sustainability Programme 'Interdisciplinary Research of Wireless Technologies' (INWITE), designed to increase the volume and quality of basic research and thus increase the centre's chances to make a good use of acquired knowledge in projects of applied and commercial research. The project is conducted by a team of five groups jointly led by professors from Vienna Technical University and Centre SIX. The groups involved in project INWITE focus on six specialisations (sensors, signals, radio frequency systems, mobile communication systems, antennas and high frequency circuits, advanced cyber security). Owing to close cooperation in international teams the centre succeeded in 2016 with several project proposals in the competition of the Czech Science Foundation. On international level, the centre became partner in two European projects.

For more information visit www.six-centre.cz.

Professor List Technology Park (VTP PL)
Professor List Technology Park was designed to support technology companies and research institutions involved in renewable energy sources, power engineering and power electrical engineering, microelectronics, control and measurement. One part of the Park contains laboratories for research on ultrahigh voltages and switching devices and the second part contains administrative buildings rented to industrial companies. The Park covers an area of 1,900 sq.m. The chief target is the development of novel technologies, products and services connected with research conducted at FEEC. In 2015 Professor List Technology Park ranked 3rd in the competition 'Entrepreneurial Project 2014', category 'Infrastructure for Support of Enterprise and Innovations' (PROSPERITA).

More atwww.vtppl.cz.

Habilitations and Appointments to Professorship

In 2016the Scientific Council made one appointment to professorship:
Prof. Ing. Jiří Mišurec, CSc.
Teleinformatics

And eight academics habilitated:
doc. Ing. Petr Mlýnek, Ph.D.
doc. Ing. Jan Hajný, Ph.D.
doc. Ing. Jiří Hošek, Ph.D.
doc. Ing. Jan Jeřábek, Ph.D.
doc. Ing. Jiří Schimmel, Ph.D.
Teleinformatics

doc. Dr. Ing. Pavel Neužil, DSc.
Electrotechnical and Electronic Technology

doc. Ing. Ondřej Vítek, Ph.D.
Power Electrical and Electronic Engineering

doc. Ing. Martin Slanina, Ph.D.
Electronics and Communications

Doctoral Programme

In academic year 2016/17 there are 401 students in the Ph.D. programme, 2 of them enrolled in the study programme in English. Numbers of Ph.D. students over the last five years are shown in Table 4.

Table 5 shows numbers of Ph.D. graduates by departments over the last five years. The list of graduates in 2016 can be found on FEEC websites, links *Study, Doctoral study programmes, Doctoral programme graduates*.

Table 4. Numbers of Ph.D. graduates from 2012 to 2016

year	2012	2013	2014	2015	2016
1.	77	79	70	84	81
2.	82	62	62	62	56
3.	85	70	50	62	48
4.	64	77	57	47	55
5.	58	49	55	45	37
6.	37	46	38	45	38
7.	41	51	43	56	52
total	444	434	375	401	369

Table 5: Numbers of Ph.D. graduates by departments from 2012 to 2016

	2012	2013	2014	2015	2016	total
UAMT	3	2	1	7	1	14
UBMI	1	4	2	2	2	11
UEEN	0	1	5	0	1	7
UETE	0	1	4	8	2	15
UMAT	2	1	4	1	0	8
UFYZ	4	2	3	6	1	16
UMEL	3	4	8	8	3	26
UREL	7	8	10	3	6	34
UTEE	1	1	4	1	3	10
UTKO	7	4	11	7	6	35
UVEE	3	5	1	2	4	15
total	31	33	53	45	29	191

Student Creative Activities

The 22 STUDENT EEICT 2016 Conference was organised on 28 April 2016. The abbreviation stands for the English words Electrical Engineering, Information and Communication Technology indicating the priority areas of research and education. There were 192 papers, 34 Bachelor, 51 Master and 102 Ph.D. papers. Five posters were presented by secondary school students. The event was sponsored by Honeywell, ABB a ON Semiconductor.

The papers were defended before 23 expert committees including representatives of sponsoring companies, academics and representatives of the club 'Students for Students'. Seventy top or outstanding papers were awarded at the closing ceremony. For more information visit FEEC websites, links *Research, Conference, Student EEICT.*

External Relations and International Cooperation

International Cooperation

International activities have been focused on increasing the prestige of FEEC by presenting results of research projects at international conferences and participating in international research and education projects, placements of FEEC students at partner universitiesabroad, and offering instruction in English to international students.

Among our priorities is student and teacher mobility involving universities cooperating within the framework of European Commission programmes. FEEC is one of the most active faculties at Brno University of Technology. We have had good cooperation with the BUT Department of International Relations responsible for organisational and economic support of programme Erasmus. As a result there were 81 placements of students of 324 months last year, 15 lecture stays of 15 weeks and two two-week trainings of academic staff (see Table 6). There were 99 students coming for placements of 380 months. Mobility figures for incoming and outgoing students in individual programmes in 2016 are in Table 8. The list of partners cooperating with FEEC within the programme Erasmus+ is in Table 9.

In 2016 funding was received for long-term international placements of students of all study programmes from the mobility development programme of Ministry of Education'International Mobility Support for of BUT Students'in the amount of 375 thous. CZK. Owing to this support 7 students could go for placements of 17 months.

Mobility figures for outgoing and incoming students in all programmes are in Table 8. It is apparent that the number of placements in 2016 was substantially lower as compared with the previous year, only 236 months. The number of incoming students was nearly the same.

The faculty supports cooperation of academics and departments with international institutions based on inter-faculty and Erasmus+ agreements, as well as seeking new contacts. Last year 37 thous. CZK was provided in support of such activities. Targeted international relations were financed by departments through operational programmes. The funds were used to cover travel expenses of internationally recognised academics coming to short lecture stays at FEEC.

The faculty invites renowned international experts to lectures, short-term stays or visits connected with involvement in research projects. Such visits help to increase the professional level of instruction and contribute to the general education of students and create an atmosphere of international environment.

An amount of 270 thous. CZK was obtained from the development programme of Ministry of Education'Support of International Mobility of Academics'. These funds were used to cover expenses of 5 FEEC experts and the lecture stay of Professor Leonid Berezansky, University of the Negev, Israel at FEEC

The faculty obtained 367 thous. CZK from the Ministry of Education development programme. 'Support of International Cooperation of BUT Brno' for cooperation of academics and Ph.D. students with international institutions and framework agreements.

Table 6: Student and teacher placements at international universities in the Erasmus programme from 2012 to 2016

Erasmus plus	2012	2013	2014	2015	2016
Students	46	49	46	81	49
Months	215	201	191	324	214
Lecture stays	27	19	23	22	15
Lecture weeks	33	22	25	22	15
Training	1	2	4	3	2
Training weeks	2	2	4	3	2

Table 7: Student placements at FEEC and abroad by programmes in 2016

Activity	Arrivals		Departures	
	Students	Months	Students	Months
Erasmus plus	86	333	49	214
Inter-university agreements	7	31,5	-	-
Development programme	-	-	7	17
Other mobility	7	19	1	5

Table 8: Student placements at FEEC and abroad in all mobility programmes from 2012 to 2016

		2012	2013	2014	2015	2016
Arrivals	Students	100	109	83	99	100
	Months	432,5	462,5	378,5	380	383,5
Departures	Students	65	60	62	102	57
	Months	261	223	227,5	361,5	236

Table 9: Universities having agreements with FEEC in the frame of the programme Erasmus for 2016/17

University	Country
University of Applied Sciences Upper Austria School of Engineering and Environmental Sciences	Austria
Technische Universität Wien- Vienna University of Technology Faculty of Electrical Engineering and Information Technology	Austria
Kunstuniversität Graz (KUG) - University of Music and Performing Arts Graz	Austria
UMIT - Universität für Gesundheitswissenschaften, Medizinische Informatik und Technik	Austria
Technische Universität Graz	Austria
University of Applied Sciences Technikum Wien	Austria
University for Continuing Education Krems	Austria
KHLIM/Limburg Catholic University College	Belgium
KU Leuven Faculty of Engineering Technology	Belgium
Technical University of Gabrovo	Bulgaria
Technical University of Sofia	Bulgaria
Technical University of Sofia, branch Plovdiv	Bulgaria
Angel Kanchev University of Ruse	Bulgaria
Hochschule RheinMain - RheinMain University of Applied Sciences	Germany
Technische Universität Dresden	Germany
Hochschule Augsburg - University of Applied Sciences	Germany

Universität Ulm	Germany
Friedrich-Alexander- Universität Erlangen-Nürnberg	Germany
Hochschule für Technik, Wirtschaft und Kultur Leipzig (Leipzig University of Applied Sciences)	Germany
Hochschule Furtwangen University	Germany
Aalborg Universitet	Denmark
TTK University of Applied Sciences, Talin	Estonia
Universitat Rovira i Virgili School of Engineering	Spain
Universitat de Vic Escola Politecnica Superior	Spain
Universidad de Cantabria	Spain
UNIVERSITAT POLITÉCNICA DE VALENCIA Escuela Politécnica Superior de Alcoy (EPSA)	Spain
Universitat Politécnica de Valencia Escuela Técnica Superior de Ingenieros de Telecomunicación	Spain
Universidad de Granada - Escuela Técnica Superior de Ingenierías Informática y de Telecomunicación (ETSIIT - UGR)	Spain
Universidad de Zaragoza	Spain
Escola Superior Politecnica (Fundació TecnoCampus Mataró – Maresme)	Spain
Universidad del País Vasco/Euskal Herriko Unibertsitatea	Spain
Universidad de Malaga School of Industrial Engineering	Spain
Universitat de Valencia	Spain
UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Spain
Institut Supérieur d´Electronique de Paris (ISEP)	France
INSA Rennes Dpt Communication Systems and Network Dpt Electronics and Computer Engineering	France
ESIEE PARIS	France
Institut Polytechnique de Grenoble	France
ESIGELEC Rouen School of Engineering	France
ESIEE Amiens	France
Université Joseph Fourier Polytech School of Engineering	France
UNIVERSITE DU MAINE	France
Eastern Macedonia and Thrace Institute of Technology	Greece
TEI of Crete Branch Chania	Greece
Technological Educational Institute (TEI) of Thessaly	Greece
UNIVERSITY OF PATRAS	Greece

Seconda Universitá degli Studi di Napoli	Italy
University of Palermo	Italy
Universitá degli Studi Mediterranea di Reggio Calabria	Italy
Vilnius Gediminas Technical University	Lithuania
Kaunas University of Technology	Lithuania
University of Malta	Malta
University of Stavanger Department of Music and Dance	Norway
POLITECHNIKA WROCLAWSKA - WROCLAV UNIVERSITY OF TECHNOLOGY	Poland
AGH University of Science and Technology Faculty of Computer Science, Electronics and Telecommunications	Poland
Politechnika Poznaňska	Poland
University of Porto Faculty of Engineering	Portugal
Instituto Politécnico de Lisboa (IPL) Instituto Superior de Engenharia de Lisboa (ISEL)	Portugal
Universidade Católica Portuguesa - Escola Superior de Biotecnologia	Portugal
Polytechnic Institute of Coimbra	Portugal
TÉCNICO LISBOA Department of Electrical Engineering and Computer Science	Portugal
Technical University of Cluj-Napoca	Romania
MALMÖ UNIVERSITY Faculty of Technology and Society	Sweden
Aalto University School of Electrical Engineering	Finland
Tampere University of Technology	Finland
University of Eastern Finland	Finland
Univerza v Novi Gorici/University of Nova Gorica	Slovenia
UNIVERSITY OF MARIBOR	Slovenia
Žilinská univerzita v Žiline - Elektrotechnická fakulta - Fakulta humanitních vied	Slovenia
Yildirim Beyazit University	Turkey
Yildiz Technical University - Dept. of Electronics and Communication Engineering - Dept. of Mathematics (Faculty of Sciences and Arts)	Turkey
T.C. Dogus University	Turkey
Bogazici University Department of Electrical & Electronics Engineering	Turkey
Istanbul Teknik Universitesi	Turkey
Suleyman Demirel University	Turkey

Işik University Faculty of Engineering	Turkey
University College London School of Engineering Sciences	Great Britain

External Relations

External relations are focused on promoting faculty activities and providing updated and specific information on study opportunitiesoffered by the faculty, study programmes and study areas. The newly structured websites, presentations and videopresentations as well as faculty profile on the social network Facebook are targeted at our future students, secondary school and technical secondary school students. In this respect, an important role was played by the so called 'Roadshow'– FEEC students popularising technical science at secondary schools.

Very popular is the recently launched competition of four-person secondary-school teams 'Merkur perFEKT Challenge'. The competition offered 9 topics, selected by the teams at registration. For capacity reasons only the first 54 applications could be accepted. This number was reached only one month after the call. Secondary schools from all over Moravia and part of Bohemia registered 200 students, including several girls. The competition was conducted in an atmosphere of fair-play, and generally the performance and knowledge of students in areas such as electrical engineering, robotics, programming, etc. must be appreciated. In February 2016 the winners of individual areas competed in the superfinals, where the winner was the team MMPD crew representing the Technical Secondary School from Zlín. This year they are owners of the challenge cup for the overall winner.

Increased attention was paid to the media, presentation of FEEC achievements in basic and applied research, development and cooperation with the industrial sector.

On FEEC websites, BUT portals and other subjects, information is given on research and education at FEEC departments and workplaces, habilitations and appointments to professorship, research and development projects of the Czech Science Foundation, Ministry of Trade and Industry, Ministry of Education and other projects including EU framework programmes. The websites are available in Czech and English.

The faculty organised the annual meeting of the Czech and Slovak faculties of electrical engineering and associated faculties in Nové Město na Moravě, 17 -19 May 2016. Exchange of experience and discussions on the current situation in education and research, solution of research projects, participation in European programmes and coordination of activities, research plans and centres and cooperation withforeign universities were on the agenda.

The Faculty commemorated the tragic event on Kubínská Hola in 1968 when an avalanche killed 6 students of the then Electrotechnical Faculty.

Contacts have been maintained with industrial companies in the Brno region and other parts of the Czech Republic. These contacts are mainly based on cooperation with FEEC departments in specific research, expert's reports and consultancy. The major cooperating companies are ABB s.r.o., Siemens A. G., Honeywell s.r.o., T-Mobile Czech Republic, a.s., ON Semiconductor Czech Republic, AT&T Czech, EATON Czech Republic, Rockwell/Allen Bradley, Škoda Volkswagen Mladá Boleslav, Motorola Solutions, National Semiconductor, ČEZ, a.s., Linet, s.r.o., BD Sensors, s.r.o., Buchlovice etc.

Cooperation continued within the two regional centres CVVOZE and SIX, and was intensified during the preparation and launching of the project of research centre of excellence 'CEITEC - Central European Institute of Technology', a joint project of six partners – four universities and two research institutes.

Another recent and significant contribution to cooperation with industrial partners is the Partner Programme constituting a platform for presentation of industrial companies, increased cooperation with research teams and theses projects.

Close cooperation of many years has been maintained with the Institute of Instrument Technology of Czech Academy of Sciences in Brno in research projects of joint interest. Members of the Institute's staff are part-time teachers at FEEC, in Master and Ph.D. programmes. Academy of Sciences can offer Ph.D. study based on a contract with the faculty. Academic staff, mainly departments of mathematics and physics, have cultivated long-term cooperation with secondary schools in the Brno region in preparing their students for studies at FEEC.

Popularisation of science and technology - 'Night of Scientists'

Research achievements are regularly presented at
the trade fair 'Ampér'

Academic Senate

In 2016 the members of Academic Senate were (LK – legislative committee, PK – pedagogical committee, EK – economic committee, KK - quality and represented department):

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

Academic Staff Chamber
Ing. Ivana Jakubová, EK, LK, KK (UREL) chair
doc. Ing. Bohuslav Bušov, CSc., EK, PK (UVEE)
Ing. Petr Číka, Ph.D., EK, PK (UTKO)
RNDr. Petr Fuchs, Ph.D., EK (UMAT)
doc. Ing. Vladislav Škorpil, CSc. (UTKO)
Ing. Martin Jílek, EK (UJAZ)
doc. Ing. Petr Mastný, Ph.D., EK, PK, KK (UEEN)
prof. Ing. Vladislav Musil, CSc., EK, LK (UMEL)
Ing. Helena Polsterová, CSc., EK (UETE)
doc. Ing. Vlasta Sedláková, Ph.D., EK, PK, KK (UFYZ)
doc. Ing. Miloslav Steinbauer, Ph.D., EK, LK, PK, KK (UTEE)
Ing. Martin Vítek, Ph.D. EK, LK (UBMI)

Student Chamber
Bc. Daniel Janík, EK, LK, PK, chair (member untilMay2016 and since October2016)
Svätopluk Blažej, LK (member since October 2016)
Bc. Martin Holčík, EK, LK (member until June 2016)
Bc. Lukáš Lučenič, PK (member until June 2016)
Miroslav Molinek, EK, KK
Mgr. Ing. Karel Sedlář, EK
Alexandra Šujanská, LK, PK (member since October 2016)
Bc. Petr Šerý, LK, KK (member since May 2016)
Bc. Martin Šelinga, PK, KK
Bc. Michal Talába, EK, PK, (member until June 2016)

Academic Senate held 10 regular meetings and discussed legislative, economic and pedagogical issues. Average attendance was 84%. Discussions were always constructive, proposals were sent to members prior to the meeting for study and comments. In MayCommission for Quality was established to assess the quality of faculty management system.

Academic Senate discussed novels of internal directives and standards, amendment to Dean's guideline to 'Study and Examination Regulations of BUT', 'Updating of the Longterm Intent of FEEC 2016-2022' for 2016 was dealt with and approved as well as the Annual Report for 2015 and economic reports for 2014 and 2015.

Economic issues discussed and approved included proposal for the distribution of financial means in 2016 and proposal on the distribution of the Balanced Fund. Budget rules were drafted at several joint meetings of economic committee and faculty management.

During 2016 four members of Student Chamber finished their studies at FEEC and resigned on membership – M.Holčík, D. Janík, L. Lučenič, M.Talába. Two substitutes elected in regular elections in 2015 – M. Molinek, and L. Lučenič took their places. S. Blažej and D. Janík were elected in supplementary elections on 4 and 5 October 2016.

Campus Development

When the faculty had moved to the campus Pod Palackého vrchem all buildings were labelled according to the adopted BUT style. A driveway to the park place behind Technická 8 was built and the parking area divided into sections to be used by FEEC and FSI staff respectively.

The laboratory 'Elektrikárium'was opened for the public at Technická 12 with exhibits designed to entertain and inform aboutelectrical engineering.

Computer Networks and Information Systems

Priority was given to:

- upgrading of servers and adaptation of facilities as a constant responsibility of OSIS
- completion of centralisation of network administration services in connection with consolidation of operation of Technická 12 and Professor List Technology Park
- network backup
- restructuring, innovation and administration of faculty websites in two languages
- full use of modern communication channels favoured by young generation, namely faculty profile on social network Facebook and Youtube channel,

Information Systems and Services

Besides the economic system SAP, the faculty uses the BUT information system. Negotiations and analyses of individual modules of the BUT system and adaptation of the information system in operation are in progress. The process will continue in 2017.

Student EEICT Conference and job opportunities fair perFEKT JobFair

Other

Equal Opportunities

The consultancy centre for support of equal education opportunities continued its activities in 2016. The centre provided professional and personal consultancy for FEEC students, and organised promotion and information events for the public aimed at removing the barriers female students face when choosing careers in technical fields.

In 2016 the centre focused its attention on improving conditions for students with specific needs in terms of financial and operational support. The centre concentrates on integration of handicapped students in full-time and part-time study programmes, promotion of study opportunities, and individual approach to students with specific needs.

The Centre cooperated with Department of Physics, club 'Students for Students' and members of faculty departments.

Contact: doc. Ing. Vlasta Sedláková, Ph.D., sedlaka@feec.vutbr.cz

Institute of Experimental Technology

Institute of Experimental Technology (IET) centres its activities on maintaining and innovating the educational activities at the faculty and on the quality of training specialists, experts and professionals experienced in contract research able to comply with the needs of the industrial sector.

The Institute was involved in two projects in 2016 - 'Institute of Experimental Technology 1' (IET1)within the framework of a global project of the South Moravian Region and 'Institute of Experimental Technology 2' (IET2) – an individual project in category Other, OP VK.

Project IET1 has been focused on a system designed to arise interest of secondary school students in electrical engineering, popularise technical science and improve conditions for teaching electrical engineering and physics, including exploitation of IT and ICT in instruction. The institute organised informal popularisation and motivation lectures at elementary and secondary schools. The staff also conducted projects for gifted secondary-school students and offered laboratories where the students can carry out experiments and tasks to support their basic knowledge.

Project IET2 conducts implementation projects to provide training for researchers and specialists in their particular fields with the view of the latest requirements of IET's industrial partners.

IET deals with extremely unfavourable scientific tasks and together with elementary, secondary and tertiary school students educates young prospective scientists able to carry out research in electrical engineering. Close contacts with authorities in science and technology contribute to education of young researchers and create an innovative potential of the coming generation. Most IET team students enter a Ph.D. programme. IET commenced and completed a number of projects for the industrial sector.

As every year, IET organised the competition '*Microcontrollers are in*' for individuals and teams from secondary schools and universities.

Representatives:
Director – prof. Ing. Pavel Fiala, Ph.D.
IET1 coordinator – doc. Ing. Jan Mikulka, Ph.D.
IET2 coordinator – prof. Ing. Pavel Fiala, Ph.D.
Members– UTEE staff, representatives of industrial partners of IET1 (Siemens, s.r.o.) and IET2 (SVS FEM, s.r.o., PROTOTYPA, a.s., ABB, s.r.o., Eaton Elektrotechnika, s.r.o.).

Address:
Institute of Experimental Technology (UTEE)
Technická 3082/12
616 00 Brno
Phone: 541 146 281
E-mail: iet@feec.vutbr.cz

Interactive Playroom 'Elektrikárium'

An interactive playroom 'Elektrikárium' was opened in December 2015. As in large scientific centres worldwide, its goal is to polularise science and technology and draw a wide spectrum of visitors. The playroom can be found at the premises of FEEC. The exhibits illustrate electricity and electronics issues.

There are 15 exhibits for the visitors' hands-on experience and entertainment that will explain the principles of electricity, electrical engineering, physics etc.

The visitors can compete in production of electricity, examine robots or laser harp. The composition of exhibits will be changed to motivate the visitors to come back.

In 2016 new exhibits were installed in the playroom in building T12. We are pleased that it arose interest of elementary and secondary schools as well the public. 'Elektrikárium' or 'PerFEKT' electro games is open to visitors from 5 years on and is free of charge.

It is open to the public Tuesday to Thursday afternoon and the whole of Saturday. For more information go to www.feec.vutbr.cz/elektrikarium.

Popularisation of technical sciences – interactive playroom 'Elektrikárium'

Student Activities

Active at FEEC are two student organisations – the voluntary club 'Students for Students' (SPS) and the Student Chamber of Academic Senate FEEC (SK AS FEKT), the student part of officially elected faculty body. Both organisations closely cooperate. The Student Chamber acts as an intermediary between faculty leadership and students, organises instruction quality assessmentto increase the quality of instruction and helps to tackle students' problems. Activities of the club 'Students for Students' are focused on leisure time. Its role is to enrich student life. The membership is voluntary, all those interested in student activities at FEEC and BUT can apply.

Magazine e-FEKT
The student magazine is issued every second month. It offers information on current events at FEEC. Moreover, technical, entertaining and many other articles can be found there.

Assistance
The club helps first-year students to adapt to life in an unfamiliar environment of the faculty, halls of residence and the town of Brno. It offers information and help with getting to know people before the start of the winter semester in the so called 'Zaškolovák'. To be able to find their way in the labyrinth of school corridors and get around the town, students are invited to the event 'PerFEKT start' organised at a weekend before the start of the semester to meet each other, explore the premises and get some tips for places to go to in their free time. For students who wish to meet during the winter semester, there are sports, cultural and entertainment events every week within the programme 'PerFEKT assistance'.

Cultural events
Social, cultural and education events are organised for students. The biggest event last year was the 9th open-air festival - '*Music from FEEC*' (Hudba z FEKTu) staged at the faculty car park on 21 September 2016. The festival

offered a rich programme, student amateur groups performed and competed, over 5,500 spectators came to see 'Fast Food Orchestra' and 'Pipes and Pints'.

Sport-loving students were invited to take part in the fun race 'Run to 53'. The task was to run the distance from school to the 53 bus stop in the shortest possible time. There were several student categories and, as every year, VIP management relays.

During the year several board games days were organised for students to spend free time and compete in tournaments. In the autumn a series of Sound system design seminars took place for students of Audio Engineering, but not only for them, and will continue next year.

'Hudba z FEKTu' – the largest university music festival in Brno

Department of Control and Instrumentation

doc. Ing. Václav Jirsík, CSc.

Head

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Professors

Prof. Ing. Pavel Jura, CSc.
Prof. Ing. Petr Pivoňka, CSc.
Prof. Ing. František Šolc, CSc.
Prof. Ing. Pavel Václavek, Ph.D.
Prof. Ing. Petr Vavřín, DrSc.
Prof. Ing. František Zezulka, CSc.
Prof. Ing. Luděk Žalud, Ph.D.

Associate Professors

doc. Ing. Ludvík Bejček, CSc.
doc. Ing. Petr Beneš, Ph.D.
doc. Ing. Petr Blaha, Ph.D.
doc. Ing. Zdeněk Bradáč, Ph.D.
doc. Ing. Petr Fiedler, Ph.D.,
doc. Ing. Václav Jirsík, CSc.

Lecturers

Ing. František Burian, Ph.D., Mgr. Terezie Filipenská, Ph.D., Ing. Marie Havlíková, Ph.D., Ing. Zdeněk Havránek, Ph.D., Ing. Radovan Holek, CSc., Ing. Peter Honec, Ph.D., Ing. Karel Horák, Ph.D., Ing. Ilona Janáková, Ph.D.,Ing. Tomáš Jílek, Ph.D., Ing. Václav Kaczmarczyk, Ph.D., Ing. Stanislav Klusáček, Ph.D., Ing. Lukáš Kopečný, Ph.D., Ing. Tomáš Macho, Ph.D., Ing. Petr Málek, CSc., Ing. Jan Pásek, CSc., Ing. Lukáš Pohl, Ph.D., Ing. Miloslav Richter, Ph.D., Ing. Soňa Šedivá, Ph.D., Ing. Radek Štohl,Ph.D, Ing. Libor Veselý, Ph.D.

Doctoral Students

Internal: Ing. Jakub Arm, Ing. Ondřej Boštík, Ing. Luděk Buchta, Ing. Martin Čala, Ing. Davídek Daniel, Ing. Lešek Franek, Ing. Petr Gábrlík, Ing. Jan Glos, Ing. Lukáš Honc, Ing. Adam Chromý, Ing. Aleš Jelínek, Ing. Miroslav Jirgl, Ing. Jiří Kárník, Ing. Jan Klečka, Ing. Jan Klusáček, Ing. Matúš Kozovský, Ing. Jan Kunz, Ing. Aleš Lebeda, Ing. Štefan Mišík, Ing. Petr Nováček, Ing. Lucie Obšilová, Ing. Lukáš Otava, Ing. Milan Papež, Ing. Michal Skalský, Ing. Jakub Streit, Ing. Ladislav Šťastný

External: Ing. Vladimír Burlak, Ing. Michaela Fendrychová, Ing. Tomáš Florián, Ing. Miroslav Graf, Ing. Daniel Haupt, Ing. Tomáš Hynčica, Ing. Ondřej Hynčica, Ing. Vlastimil Kříž, Ing. Jaroslav Lepka, Ing. Stanislav Mašláň, Ing. Zbyněk Mynář, Ing. Petr Petyovský. Ing. Stanislav Pikula, Ing. Peter Rášo, Ing. Karel Stibor, Ing. Michal Šír, Mgr. Martin Tůma, Ing. Miroslav Uher, Ing. Michal Vašina, Ing. Ivo Veselý

Administrative and Technical Staff

Ing. Luděk Anděra, Ing. Martin Čala, Ing. Daniel Davídek, Ing. Adam Chromý, Ing. Aleš Jelínek, Ing. Miroslav Jirgl, Ing. Jan Klečka,Ing. Petr Nováček,Lenka Petrová, Ing. Petr Petyovský, Ing. Stanislav Pikula, Ing. Miroslav Uher, Ing. Soběslav Valach, Ing. Ivo Veselý, Jan Vodička

Main Interests

The department provides instruction in the Bachelor degree programme Control and Measurement and the follow-up Master degree programme Cybernetics, Control and Measurement. Instruction and research are conducted by five specialised groups.

The main interest of the group involved in automatic control was robust and predictive electrical drives control. Research of nonlinear estimators for sensor-free drives control continued. Research outcomes have been applied within the competence centre projects, namely TA ČR CAK3 – 'Centre of Applied Cybernetics' and CIDAM – 'Centre of Intelligent Drives and Advanced Machine Control'. In cooperation with the 'Centre of Excellence CEI-TEC', the group was involved in international projects H2020 '3Ccar Integrated Components for Complexity Control in Affordable Electrified Cars' and OSEM-EV 'Optimised and Systematic Energy Management in Electric Vehicles'. Intensive research was carried out in the field of theoretical probability filtration of dynamical systems, automatic setting algorithms of filter parameters with possible suppression of system model vagueness. The group continued its cooperation with Freescale Semiconductor (now NXP) and Infineon Technologies) in the development of robust and predictive algortihms for alternating electrical drives.

The group of measurement technology focuses on electrical and electronic measurements, virtual instruments in the LabView environment, sensors of non-electrical characteristics, measurements and evaluation of non-electrical characteristics with focus on vibrodiagnostics, thermodiagnostics, acoustic emission, flux and noise measurement.

The group involved in industrial automation deals with real-time embedded systems, wireless communication systems and industrial Ethernet with focus on operational safety and protection against external and internal errors, faults and attacks. Furthermore, the group is involved in research of decentralised and distributed control and communication systems. Research is also centred on control systems for buildings and complexunits. Instruction is focused on subjects dealing with control and automation industrial technology (embedded systems, programmable automatics, SCADA systems, Průmysl 4.0 technology, functionalsafety). The group closely cooperates with BD Sensors, Beta Control, ModemTec, Siemens, Rockwell Automation, Škoda Auto etc.

The group of artificial intelligence and robotics is involved in research of service mobile robotics. Research is mainly concerned with telepresence control of mobile robots in difficult terrain, self-localisation in outer environment, in urban areas and interiors of buildings, design of highly reliable robotic systems for work under extreme conditions, and automatic map-making. Now we entered the third year of research on employment of elements of advanced optical scanning and virtual/extended reality in biomedical engineering, especially for cardio- and neuro-rehabilitation. Instruction encompasses introduction into stationary and mobile robotics and sections dealing with above mentioned research issues. A new subject Practical Robotics and Computer Vision has been introduced where the students can assemble their own robot and can earn credits for racing.

The long-term prime interest in computer vision is applied research and development of industrial and transport visual systems. The group cooperates with a number of commercial companies and university departments. Academics are involved in research project solution and research contracts, and provide instruction in signal and image processing and analysis, localisation, recognition and reconstruction of 3D bodies. Part of the group deals with specialised hardware design on the basis of FPGA/DSP platforms for processing of extensive data files in real time. The staff is involved in more than ten subjects in Bachelor and Master programmes, and TAČR, MPO, MŠMT, UAMT and CEITEC research projects.

One of the robots constituting the system ATEROS

Research teams are engaged in the project of European 'Centre of Excellence' OP VaVpI CEITEC – Central European Technology Institute, group Cybernetics for Materials Science involved in cutting-edge research oncontrol, sensors, robotics and embedded systems.

The department's two laboratories are part of the 'Centre for Research and Utilisation of Renewable Energy' (CVVOZE). They focus on developing a smart grid model with different renewable sources to test grid stabilisation algorithms, operation of certified rooms for vibration and climate testing, and training and testing laboratories for safety control systems.

Major Achievements

The group focused on automatic control joined international projects H2020 3Ccar and OSEM-EV and cooperates with the 'Centre of Excellence CEITEC' and major international partners. The group publishes in leading journals (e.g. IEEE Transaction on Industrial Electronics) and attends conferences on theory(e.g. IEEE Conference on Decision and Control) and applications(e.g. IECON – Annual Conference of IEEE Industrial Electronics Society).

The group of measurement technology involved in projects VaVPI invested in upgrading of the laboratories for measurement of noise, vibrations and temperature. The Climate and Vibration Test Laboratory was re-accredited, and a new Calibration Laboratory has been prepared for accreditation. The structure of instruction was completely re-organised, with introduction of new compulsory subjects.

The group of industrial automation dealt with several significant projects, mainly 'Research and Development of a Filter Ventillation Unit for Protection from Chemical Substance', 'Dust and Biological Infection in Personal Protection Means' and REVYT.

The group of artificial intelligence and robotics focused on the system for visual telepresence with high resolution and option to combine data from TOF proximity scanners, CCD sensors and thermovision cameras. The reconnaissance robotic system Morpheus with a unique system of drives inside wheel discs was presented. And a system for precise self-localisation and navigation in outer environment was designed.

The group of computer vision continued research in TAČR CK TE01020197 project 'Centre of Applied Cybernetics', as investigator of the package 'Camera systems and methods of image analysis for monitoring in transportation and industry'. Research activities of CAK are centred on sophisticated computer vision problems in traffic applications, driving assistance systems and industrial camera inspection systems. Another important research objective is the development of our own systems for processing large volumes of data on the basis of FPGA/DSP platforms e.g. the high rate 4K camera with 10G Ethernet optical interface. The group is involved in several research and development projects, worked on transformation of a number of courses related to computer vision and launched the course Recognition and previously Computer Learning for the students to acquire complex and at the same time detailed knowledge.

Major Research Projects

Centre for Intelligent Drives and Advanced Machine Control – Technology Agencyof the Czech Republic – CK

Investigator:Zdeněk Peroutka, investigator at UAMT:Pavel Václavek

Research, Design and Pilot Function Verification of an Integrated Intelligent Parking System (ISIP) – Technology Agency of the Czech Republic – ALFA TA03030333

Investigator: Peter Honec

Centre of Competence, Technology Agencyof the Czech Republic – Advanced Sensors and Sensor Data Processing Techniques – Project TA ČR TE02000202

Investigator:Antonín Platil, ČVUT, investigator at UAMT:Petr Beneš

Centre of Applied Cybernetics III. – Technology Agency of the Czech Republic – CK TE01020197

Investigator:Vladimír Kučera, ČVUT, investigator at UAMT:Pavel Václavek

REVYT - Recuperation of the Lift Loss Energy for the Lift IdleConsumption – TAČR - TA03020907

Investigator:Zdeněk Bradáč

Safety, Information and Interactive Smart City Terminal – MPO TRIO - FV10068

Investigator:Zdeněk Bradáč

Selected Publications

JELÍNEK, A.; ŽALUD, L.; JÍLEK, T. Fast total least squares vectorization. *Journal of Real- Time Image Processing,* 2016, p. 1-17. ISSN: 1861-8200.

KŘÍŽ, V. Právní aspekty provozu bezpilotních letadel - dronů. *Automa,* 2016, č. 1/ 2016, s. 10-14. ISSN: 1210-9592.

CHROMÝ, A. Application of High- Resolution 3D Scanning in Medical Volumetry. *International Journal of Electronics and Telecommunications,* 2016, vol. 62, no. 1, p. 23-31. ISSN: 2081-8491.

MYNÁŘ, Z.; VESELÝ, L.; VÁCLAVEK, P. PMSM Model Predictive Control with Field Weakening Implementation. *IEEE Transactions on Industrial Electronics,* 2016, vol. 63, no. 8, p. 5156-5166. ISSN: 0278-0046.

HORÁK, K.; DAVÍDEK, D.; ČÍP, P. Automatic Traffic Sign Detection and Recognition Using Colour Segmentation and Shape Identification. *MATEC Web of Conferences,* 2016, vol. 68, no. 17002, p. 1-6. ISSN: 2261-236X.

FRANEK, L. Moderní datový koncentrátor. *Energetika,* 2016, roč. 66, č. 4, s. 273-275. ISSN: 0375-8842.

OBŠILOVÁ, L.; HAVLÍKOVÁ, M.; BRADÁČ, Z. Neuromuskulární systém člověka. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2016, roč. 18, č. 4, s. 122-127. ISSN: 1213-1539.

FIALKA, J.; BENEŠ, P.; MICHLOVSKÁ, L.; KLUSÁČEK, S.; PIKULA, S.; DOHNAL, P.; HAVRÁNEK,Z. Measurement of thermal depolarization effects in piezoelectric coefficients of soft PZT ceramics via the frequency and direct methods. *Journal of the European Ceramic Society,* 2016, vol. 36, no. 11, p. 2727-2738. ISSN: 0955-2219.

JIRGL, M.; JALOVECKÝ, R.; BRADÁČ, Z. Models of pilot behavior and their use to evaluate the state of pilot training. *Journal of Electrical Engineering,* 2016, vol. 67, no. 4, p. 267-272. ISSN: 1335-3632.

HORÁK, K.; ŽALUD, L. Image Processing on Raspberry Pi for Mobile Robotics. *International Journal of Signal Processing Systems,* 2016, vol. 4, no. 6, p. 494-498. ISSN: 2315-4535.

Bachelor's Courses

Číslicová řídicí technika
(prof. Ing. Petr Pivoňka, CSc.)

Databázové systémy
(Ing. Radovan Holek, CSc.)

Logické obvody a systémy
(Ing. Radovan Holek, CSc.)

Měření fyzikálních veličin
(doc. Ing. Petr Beneš, Ph.D.)

Měření v elektrotechnice
(Ing. Soňa Šedivá, Ph.D.)

Mikroprocesory
(Ing. Tomáš Macho, Ph.D.)

Modelování a simulace
(prof. Ing. Pavel Václavek, Ph.D.)

Moderní prostředky v automatizaci
(doc. Ing. Václav Jirsík, CSc.)

Počítače a programování 1
(doc. Ing. Václav Jirsík, CSc.)

Počítače a programování 2
(doc. Ing. Václav Jirsík, CSc.)

Praktická robotika a počítačové vidění
(prof. Ing. Luděk Žalud, Ph.D.)

Praktické programování v C++
(Ing. Miloslav Richter, Ph.D.)

Programovatelné automaty
(Ing. Radek Štohl, Ph.D.)

Prostředky průmyslové automatizace
(Ing. Radek Štohl, Ph.D.)

Řízení a regulace 1
(doc. Ing. Petr Blaha, Ph.D.)

Řízení a regulace 2
(prof. Ing. Pavel Václavek, Ph.D.)

Signály a systémy
(prof. Ing. Pavel Jura, CSc.)

Snímače
(doc. Ing. Petr Beneš, Ph.D.)

Subsystémy PC
(Ing. Soběslav Valach)

Virtuální instrumentace v automatizaci
(Ing. Zdeněk Havránek, Ph.D.)

Výpočetní technika v automatizaci
(prof. Ing. Petr Pivoňka, CSc.)

Základy robotiky
(prof. Ing. Luděk Žalud, Ph.D.)

Zpracování a digitalizace analogových signálů
(Ing. Zdeněk Havránek, Ph.D.)

Zpracování vícerozměrných signálů
(Ing. Karel Horák, Ph.D.)

Master's Courses

Automatizace procesů
(doc. Ing. Zdeněk Bradáč, Ph.D.)

Distribuované systémy a sítě
(doc. Ing. Petr Fiedler, Ph.D.)

Elektronické měřicí systémy
(Ing. Marie Havlíková, Ph.D.)

Embedded systems for industrial control
(doc. Ing. Petr Fiedler, Ph.D.)

Funkční bezpečnost v průmyslové automatizaci
(Ing. Radek, Štohl, Ph.D.)

Fuzzy systémy
(prof. Ing. Pavel Jura, CSc.)

Logické systémy
(Ing. Radovan Holek, CSc.)

Měřicí technika pro diagnostiku
(Ing. Stanislav Klusáček, Ph.D.)

Modelování a identifikace
(doc. Ing. Petr Blaha, Ph.D.)

Operační systémy a sítě
(Ing. Tomáš Macho, Ph.D.)

Optimalizace regulátorů
(prof. Ing. Petr Pivoňka, CSc.)

Počítače pro řízení
(doc. Ing. Zdeněk Bradáč, Ph.D.)

Počítačové vidění
(Ing. Karel Horák, Ph.D.)

Robotika
(prof. Ing. Luděk Žalud, Ph.D.)

Robustní a algebraické řízení
(doc. Ing. Petr Blaha, Ph.D.)

Rozpoznávání
(Ing. Karel Horák, Ph.D.)

Sběr, analýza a zpracování dat
(Ing. Marie Havlíková, Ph.D.)

Speciální snímače
(Ing. Stanislav Klusáček, Ph.D.)

Strojové učení
(Ing. Karel Horák, Ph.D.)

Systémy diskrétních událostí
(prof. Ing. Pavel Václavek, Ph.D.)

Teorie dynamických systémů
(doc. Ing. Petr Blaha, Ph.D.)

Umělá inteligence
(doc. Ing. Václav Jirsík, CSc.)

Ph.D. Courses

Vybrané kapitoly měřicí techniky
(doc. Ing. Ludvík Bejček, CSc.)

Vybrané kapitoly řídicí techniky
(prof. Ing. Petr Pivoňka, CSc.)

Laboratories

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

Laboratory of Electrical Measurement (second-year study areas B-AMT, B-MET, B-SEE and part-time second-year study areas BK-AMT, BK-SEE, Marie Havlíková)

Laboratory of Electronic Measurement (instruction in Measurement in Electrical Engineering for first-year study areas M-AMT, M-EST, Soňa Šedivá)

Laboratory of Intelligent Controllers (instruction in control algorithms, physical models, design and verification of control algorithms on principles of artificial intelligence, Petr Pivoňka)

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

Laboratory of Airflow and Pressure Measurement (airflow and pressure measurement – testing air track, Ludvík Bejček)

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

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

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

Laboratory of Computer Vision (instruction, research and development of devices for image recording and methods of image processing and analysis for recognition and modelling of objects, Karel Horák)

Laboratory of Process Automation (CAK laboratory, research and development of communication technology for industrial applications including wireless communication technology, research of Real-Time Control systems and Fault -Tolerant systems, František Zezulka)

Laboratory of Programmable Automatics (control systems Rockwell, instruction and development of software for PLC of Rockwell, instruction and development of communication via DeviceNet and Ethernet IP, Radek Štohl)

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

Laboratory of Drives Control (research of intelligent algorithms for control of electric drives, Pavel Václavek)

Laboratory of PC Subsystems (instruction, research and development of advanced peripheral devices and elements based on FPGA/DSP for real-time processing of large volumes of data, Soběslav Valach)

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

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

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

CVVOZE Laboratory of Automation (safe control systems, experimental power grid, František Zezulka)

CVVOZE Testing Laboratory (accredited testing of machine, electrotechnical and electronic components, products and parts, ČSN EN 60068-2-xx tests (vibrations, shocks, cold, heat, moisture, combined, Petr Beneš.)

Open Days

Department of Biomedical Engineering

Prof. Ing. Ivo Provazník, Ph.D.

Head

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doc. Ing. Aleš Drastich, CSc.
doc. Ing. Milan Chmelař, CSc.
doc. Ing. Radim Kolář, Ph.D.
doc. Ing. Jana Kolářová, Ph.D.
doc. Ing. Jiří Kozumplík, CSc.
doc. Ing. Jiří Rozman, CSc.

Lecturers

RNDr. Mgr. Michal Bittner, Ph.D., Ing. Vratislav Čmiel, Ph.D., Ing. Oto Janoušek, Ph.D., Ing. Radovan Jiřík, Ph.D., Ing. Vratislav Harabiš, Ph.D., Ing. Denisa Maděránková, Ph.D., Ing. Jan Odstrčilík, Ph.D., Sudeep Roy, Ph.D., Ing. Jiří Sekora, Ing. Lukáš Smital, Ph.D., Ing. Helena Škutková, Ph.D., Ing. Martin Vítek, Ph.D.

Doctoral Students

Ing. Layal Abo Khayal, Ing. Larisa Baiazitova, Ing. Jaroslav Balogh, Ing. Mgr. Jan Cimbálník, Ing. Vratislav Čmiel, Ing. Jiří Dvořák, Ing. Lucie Grossová, Ing. Jakub Hejč, Ing. Branislav Hesko, Ing. Pavla Horáková (roz. Ronková), Ing. Michal Hracho, Ing. Jiří Chmelík, Ing. Roman Jakubíček, Ing. Robin Jugas, Ing. Jakub Jurek, Ing. Jakub Kašpar, Ing. Pavlína Koščová, Ing. Markéta Koťová, Ing. Martin Králík, Ing. Jiří Kratochvíla, Ing. Kristýna Kupková, Ing. Vladimíra Kubicová, Ing. Alena Kubičková (roz. Drkošová), Ing. René Labounek, Ing. Martin Lamoš, Ing. Ivana Liberdová, Ing. Lucie Maršánová, Mgr. Peter Langer, Ing. Pavel Leinveber, Ing. Ondřej Macíček, Ing. Magdaléna Matejková, Ing. Martin Mézl, Ing. Andrea Němcová, Ing. Tomáš Potočňák, Ing. Tereza Reichlová, Ing. Marina Ronzhina, Ing. Karel Sedlář, Ing. Jiří Sekora, Ing. Tomáš Slavíček, Ing. Radovan Smíšek, Ing. Ladislav Soukup, Ing. Ondřej Svoboda, Ing. Veronika Svozilová, Ing. Radim Šejnoha, Ing. Tomáš Šikner, Ing. Petra Štohanzlová (roz. Podlipná), Ing. Petr Veselý, Ing. Tomáš Vičar, Ing. Petr Walek

Administrative and Technical Staff

Ing. Gabriela Petrovičová, Miroslava Prášilová, Hana Rýznarová, MUDr. Šárka Sekorová

Main Interests

The department provides instruction in processing of signals and images, biomedical and ecological engineering, environmental studies, biomedical technology and bioinformatics in Bachelor, Master and Ph.D. programmes.

The department is involved in basic and applied research on engineering principles in neuroscience, cardiology, physiology, electrochemistry, botany, genetics and molecular biology. The main areas of interest are digital processing and analysis of especially cardiological signals, including experimental cardiology in cooperation with Faculty of Medicine, Masaryk University.Other research interests are analyses of polysomnographic data, EEG signals as related to temporal studies or fMRI acquisition, digital processing and analysis of medical images for different imaging modalities, mainly ultrasonography, MRI, CT, microscopy and computer vision. The latest methods of processing large data volumes are applied including methods of deep learning or parallelisation of complex calculations on GPU. Research is also focused on cell biology. It is mainly utilisation of confocal microscopy or fast fluorescence microscopy for study of viability and proliferation of cells, impact of nanoparticles on cellular behaviour, measurement of intracellular calcium of cardiomyocites or using optical methods to study mechanical properties of cells. There has been rapid development in research on bioinformatics, proteomics, genomics, and lately metagenomics. Projects are centred on methods of evolutionaary and similarity analysis of genomic and proteomic data, methods for construction of bacterial genomes from de novo sequence data, search for genes in all genome data and analysis of pharmacofore of natural molecules of potentially healing substances.

Research issues relate to education. The department supportsawider education of students. In 2016 they attended the largest world fair trade of biomedical technology Medica in Düsseldorf and visited a number of top institutions in the field (National Tissue Centre), Masaryk Oncological Institute, etc.).

In research and instruction the department closely cooperateswithOphtalmological Clinic of Friedrich-Alexander-University Erlangen (Germany), University of Bergen (Norway), the companies Philips Czech Republic, Philips Nederlands, MIKRO s.r.o., VUP Medical, a.s., MDT-Medical Data Transfer, s.r.o., Touchless Biometric Systems s.r.o., Smart Brain Sale, s.r.o., Institute of Instrument Technologyof Academy of Sciences, Faculty of Medicineof Masaryk University in Brno, Mendel University, Research Institute of Veterinary Medicine, University of Chemistry and Technology in Prague, Faculty Hospital Bohunice and Faculty Hospital u sv. Anny in Brno.
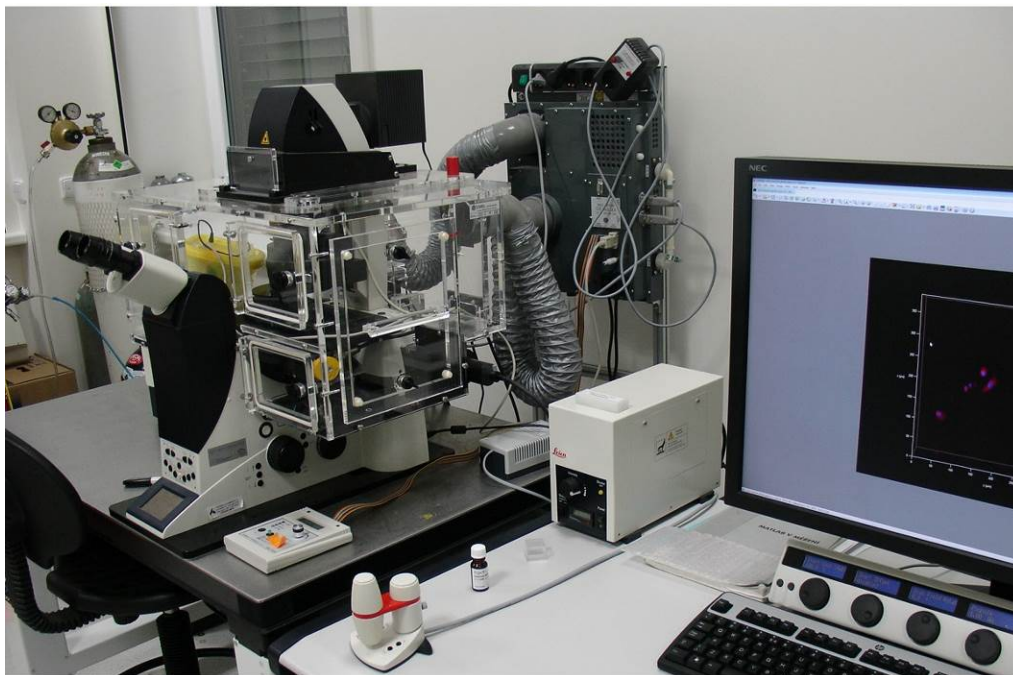
One of the department's laboratories

Major Achievements

In 2016 members of the department published more than 20 papers, most of them in non-zero impact factor journals. Among the most notable achievements are papers in 'Current Opinion in Neurology', 'Biotechnology for Biofuels' and 'IEEE Transactions on Terahertz Science and Technology'. Scientific outcomes were presented at conferences such as 'Computing in Cardiology' or 'International Symposium on Biomedical Imaging'.

Members of the department co-organise the World Congress on Medical Physics and Biomedical Engineering, the major world conference on research in biomedical engineering. They also cooperate in preparation of the specialised section of the international conference on medical imaging and processing 'Computational Vision and Medical Image Processing'.

In December 2016 the department organised, in cooperation with Association of Medical Equipment Suppliers representing major industrial partners in the field of biomedical engineering, an educational event 'Window into the World of Production and Sales of Medical Equipment' where a number of Czech companies were presented. The event was attended by our students and many secondary school students for whom we prepared a tour of our laboratories.

In 2016 two grant projects were completed (GAČR and MŠMT COST CZ) as well as a standard project and two student projects of Internal Grant Agency of VUT.

Major Research Projects

An Analysis of the Relationship between Electrical Processes and Blood Flow in Heart Chambers – GAČR P102/12/2034

Investigator:Jana Kolářová

Novel Solutions for Multimodal Biometrics – Increased Reliability of Biometric Technology – LD14013

In cooperation with Institute of Intelligent Systems,FIT, investigatorMartin Drahanský

Selected Publications

KUBIČKOVÁ, A.; KOZUMPLÍK, J.; NOVÁKOVÁ, Z.; PLACHÝ, M.; JURÁK, P.; LIPOLDOVÁ, J. Heart Rate Variability Analysed by Poincaré Plot in Patients with Metabolic Syndrome. *JOURNAL OF ELECTROCARDIOLOGY,* 2016, vol. 49, no. 1, p. 23-28. ISSN: 0022-0736.

BAIG, M.; AHMAD, K.; ROY, S.; ASHRAF, J.; ADIL, M.; SIDDIQUI, M.; KHAN, S.; KAMAL, M.; PROVAZNÍK, I.; CHOI, I. Computer Aided Drug Design: Success and Limitations. *CURRENT PHARMACEUTICAL DESIGN,* 2016, vol. 22, no. 5, p. 572-581. ISSN: 1381-6128.

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CIMBÁLNÍK, J.; KUCEWICZ, M.T.; WORRELL, G. Interictal high- frequency oscillations in focal human epilepsy. *CURRENT OPINION IN NEUROLOGY,* 2016, vol. 29, no. 2, p. 175-181. ISSN: 1350-7540.

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KLIMEŠ, P.; HALÁMEK, J.; JURÁK, P. The Functional Organization of Human Epileptic Hippocampus. *JOURNAL OF NEUROPHYSIOLOGY,* 2016, vol. 4, no. 115, p. 1-10. ISSN: 0022-3077.

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KAEVSKA, M.; LORENCOVÁ, A.; VÍDEŇSKÁ, P.; SEDLÁŘ, K.; PROVAZNÍK, I.; TRČKOVÁ, M. Effect of sodium humate and zinc oxide used in prophylaxis of post- weaning diarrhoea on faecal microbiota composition in weaned piglets. *Veterinární medicína,* 2016, vol. 61, no. 6, p. 328-336. ISSN: 0375-8427.

PLEŠINGER, F.; KLIMEŠ, P.; HALÁMEK, J.; JURÁK, P. Taming of the monitors: reducing false alarms in intensive care units. *PHYSIOLOGICAL MEASUREMENT,* 2016, vol. 37, no. 8, p. 1313-1325. ISSN: 0967-3334.

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ČERVINKOVÁ, I.; WALEK, P.; JÍRA, I.; SKOTÁKOVÁ, J.; ŠENKYŘÍK, J.; OUŘEDNÍČEK, P.; JAN, J. Possibilities of Reducing Radiation Dose in Computed Tomography Examinations in Various Age Groups Using an Iterative Model- Based Reconstruction Technique. *Pediatrics & Therapeutics,* 2016, vol. 6, no. 4, p. 1-7. ISSN: 2161-0665.

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SMÍŠEK, R.; MARŠÁNOVÁ, L.; NĚMCOVÁ, A.; VÍTEK, M.; KOZUMPLÍK, J.; NOVÁKOVÁ, M. CSE database: extended annotations and new recommendations for ECG software testing. *Medical and Biological Engineering and Computing,* 2016, vol. 54, no. 12, p. 1-10. ISSN: 0140-0118.

SMÍŠEK, R.; PLEŠINGER, F.; JURÁK, P.; HALÁMEK, J.; POSTRÁNECKÁ, T. Odstranění stimulačních hrotů ze signálu elektrokardiografu. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2016, roč. 18, č. 6, s. 160-168. ISSN: 1213-1539.

Bachelor's Courses

Algoritmizace a programování
(doc. Ing. Jana Kolářová, Ph.D.)

Analýza biologických signálů
(doc. Ing. Jiří Kozumplík, CSc.)

Bioelektrické jevy
(doc. RNDr. Ing. Jiří Šimurda, CSc.)

Biochemie
(prof. RNDr. Eva Táborská, CSc.)

Bioinformatika
(prof. Ing. Ivo Provazník, Ph.D.)

Biostatistika
(doc. RNDr. Ladislav Dušek, Ph.D.)

Číslicové zpracování a analýza signálů
(prof. Ing. Jiří Jan, CSc.)

Číslicové zpracování signálů a obrazů
(prof. Ing. Jiří Jan, CSc.)

Ekologie v elektrotechnice
(doc. Ing. Jiří Rozman, CSc.)

Ekologie ve zdravotnictví
(doc. Ing. Jiří Rozman, CSc.)

Elektronické systémy a měření
(doc. Ing. Milan Chmelař, CSc.)

Lékařská diagnostická technika
(doc. Ing. Radim Kolář, Ph.D.)

Modely v biologii a epidemiologii
(Ing. Martin Vítek, Ph.D.)

Obecná biofyzika
(prof. MUDr. Vojtěch Mornstein, CSc.)

Patologická fyziologie
(prof. MUDr. Anna Vašků, CSc.)

Počítače a programování
(prof. Ing. Ivo Provazník, Ph.D.)

Praktika z bioinformatiky
(doc. Ing. Jana Kolářová, Ph.D.)

Radiologie a nukleární medicína
(prof. MUDr. Vlastimil Válek, CSc.)

Silnoproudá a přístrojová elektrotechnika
(doc. Ing. Milan Chmelař, CSc.)

Standardizace ve zdravotnictví
(doc. Ing. Milan Chmelař, CSc.)

Terapeutická a protetická technika
(doc. Ing. Jana Kolářová, Ph.D.)

Umělá inteligence v medicíně
(doc. Ing. Jiří Kozumplík, CSc.)

Úvod do biologie člověka
(prof. MUDr. Jindřich Vomela, CSc.)

Úvod do klinické medicíny
(doc. MUDr. Miroslav Souček, CSc.)

Úvod do medicínské informatiky
(prof. Ing. Ivo Provazník, Ph.D.)

Úvod do molekulární biologie a genetiky
(doc. Ing. Petr Dvořák, CSc.)

Základy anatomie a histologie
(doc. MUDr. Pavel Matonoha, CSc.)

Základy první pomoci
(MUDr. Lukáš Dadák)

Zdravotnická etika
(Mgr. Josef Kuře, Dr. phil.)

Zdravotnická legislativa a právo
(doc. Ing. Jiří Rozman, CSc.)

Zobrazovací systémy v lékařství
(doc. Ing. Aleš Drastich, CSc.)

Master's Courses

Analýza a interpretace biologických dat
(doc. Ing. Jiří Kozumplík, CSc.)

Analýza biologických sekvencí
(prof. Ing. Ivo Provazník, Ph.D.)

Analýza biomedicínských obrazů
(prof. Ing. Jiří Jan, CSc.)

Analýza signálů a obrazů
(prof. Ing. Jiří Jan, CSc.)

Bioetika
(Ing. Iva Pipalová)

Biofyzika
(doc. RNDr. Ing. Jiří Šimurda, CSc.)

Biologie člověka
(prof. MUDr. Jindřich Vomela, CSc.)

Diagnostika bio- a ekosystémů
(doc. Ing. Radim Kolář, Ph.D.)

Ekologické inženýrství
(doc. Ing. Jiří Rozman, CSc.)

Evoluční algoritmy
(doc. Ing. Jiří Kozumplík, CSc.)

Klasické zobrazovací systémy v medicíně a ekologii
(doc. Ing. Aleš Drastich, CSc.)

Klinická fyziologie
(prof. MUDr. Jindřich Vomela, CSc.)

Laboratorní technika v genomice a proteomice
(doc. Ing. Jana Kolářová, Ph.D.)

Medicínské informační systémy
(Ing. Miroslav Dvořák, CSc.)

Mikroskopická zobrazovací technika
(doc. Ing. Radim Kolář, Ph.D.)

Modelování biologických systémů
(Ing. Martin Vítek, Ph.D.)

Molekulární biologie
(doc. PharmDr. Petr Babula, Ph.D.)

Návrh a provoz komplexních systémů
(doc. Ing. Jiří Rozman, CSc.)

Počítačová podpora lékařské diagnostiky
(prof. Ing. Ivo Provazník, Ph.D.)

Pokročilá analýza biologických signálů
(doc. Ing. Jiří Kozumplík, CSc.)

Pokročilé metody v biostatistice
(doc. RNDr. Ladislav Dušek, Ph.D.)

Programování v bioinformatice
(doc. Ing. Jana Kolářová, Ph.D.)

Speciální lékařská a ekologická technika
(doc. Ing. Jiří Rozman, CSc.)

Systémová biologie
(prof. Ing. Ivo Provazník, Ph.D.)

Tomografické zobrazovací systémy
(doc. Ing. Aleš Drastich, CSc.)

Úvod do environmentalistiky
(RNDr. Mgr. Michal Bittner, Ph.D.)

Vizualizace biomedicínských dat
(Ing. Radovan Jiřík, Ph.D.)

Vyšší metody zpracování signálů
(prof. Ing. Jiří Jan, CSc.)

Základy metodologie výzkumu
(doc. Ing. Radim Kolář, Ph.D.)

Zdravotní péče
(prof. MUDr. Jindřich Vomela, CSc.)

Zdravotní péče v mimořádných situacích
(doc. MUDr. Vladimír Šrámek, Ph.D.)

Zdravotnické informační systémy
(Ing. Miroslav Dvořák, CSc.)

Ph.D. Courses

Moderní metody ve výzkumu elektrofyziologie
(prof. MUDr. Marie Nováková, Ph.D.)

Moderní přístupy v analýze biomedicínských obrazů
(doc. Ing. Radim Kolář, Ph.D.)

Nové trendy v analýze a klasifikaci biomedicínských
dat (doc. Ing. Jiří Kozumplík, CSc.)

Pokročilá analýza rozsáhlých genomických dat
(prof. Ing. Ivo Provazník, Ph.D.)

Pokročilé mikroskopické techniky v biologii
(doc. PharmDr. Petr Babula, Ph.D.)

Vybrané problémy biomedicínského inženýrství
(prof. Ing. Ivo Provazník, Ph.D.)

Vyšší metody zpracování a analýzy signálů a obrazů
(prof. Ing. Jiří Jan, CSc.)

Laboratories

Laboratory of Electronics (manufacture and testing of electromechanical and electronic components for research and student projects, Jiří Sekora

Laboratory of Biophysics I and II (instruction in Biophysics, Bioelectric Phenomena, research on electrophysiology of cells, Vratislav Čmiel)

Laboratory of Biomedical Technology (instruction in Design and Operation of Complex Systems, Electronic Systems and Measurement, experimental research and student projects, Jiří Sekora)

Laboratory of Bionics (instruction in Human Biology, Biophysics, Clinical Physiology, Healthcare, Therapeutic and Prosthetic Technology, experimental measurements for research and student projects, Oto Janoušek)

Laboratory of Diagnostic Technology (instruction in Medical Diagnostic Technology, Diagnostics of bio- and ecosystems, experiments for research and student projects, Vratislav Harabiš)

Laboratory of Environmental Technology (instruction in Special Medical and Ecological Technology, Ecology in Electrical Engineering, Ecology in Healthcare, experiments for research and student projects, Jiří Rozman)

Laboratory of Functional Diagnostics (instruction in Electronic Systems and Measurements, research of brain and muscle electrophysiology, Marina Ronzhina)

Laboratory of Genomics and ProteomicsI and II (a clean environment for isolation and handling of biological samples, measurement and diagnostics of DNA, RNA and proteins, instruction in Molecular Biology, research on bioinformatics, Helena Škutková)

Laboratory of Information Systems (instruction in Evolution Algorithms, Medical Information Systems, Artificial Intelligence in Medicine, Bioinformatics,Algorithmization and Programming, Computers and Programming, Analysis of Biological Sequences, Bioinformatics Practice, Denisa Maděránková)

Laboratory of Microscopy I and II (instruction in Microscopic Imaging Technology, experiments for research and student projects, research on optical coherent tomography, Jan Odstrčilík)

Laboratory of Rehabilitation Technology (experimental measurements for research and students projects, research on rehabilitation technology, Marina Ronzhina)

Laboratory of Ultrasound Tomography (research and measurement of ultrasonographic data, calibration of devices and ultrasound probes, Vratislav Harabiš)

Laboratory of Imaging Systems (instruction in Introduction in Medical Informatics, Medical Information Systems, experiments for research and student projects, Radim Kolář)

Laboratory of Image Processing (instruction in Analysis of Biological Signals, Bioinformatics, Conventional Imaging Systems in Medicine, Advanced Analysis of BIological Signals, Analysis and Interpretation of Biological Data, Digital Processing of Signals and Images, Tomography Imaging Systems, Jiří Sekora)

Laboratory of Signal Processing(instruction in Programming in Bioinformatics, Computer Support for Medical Diagnostics, Introduction in Medical Informatics, Analysis of Signals and Images, Biomedical Data Visualisation, Analysis of Biomedical Images, Models in Biology and Epidemiology, System BIology, Digital Signal Processing and Analysis, Martin Vítek)

Department of Power Electrical Engineering

doc. Ing. Petr Toman, Ph.D.

Head

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Associate Professors

doc. Ing. Petr Baxant, Ph.D.
doc. Ing. Vladimír Blažek, CSc.
doc. RNDr. Oldřich Coufal, CSc.
doc. Ing. Jiří Drápela, Ph.D.
doc. Ing. Ilona Lázničková, Ph.D.

doc. Ing. Petr Mastný, Ph.D.
doc. Ing. Jaroslava Orságová, Ph.D.
doc. Ing. Radek Škoda, Ph.D.
doc. Ing. Petr Toman, Ph.D.

Lecturers

Ing. Branislav Bátora, Ph.D., Ing. Karel Katovský, Ph.D., Ing. Michal Krbal, Ph.D., Ing. Jan Macháček, Ph.D., Ing. Jiří Martinec, Ph.D., Ing. Martin Paar, Ph.D., Ing. Michal Ptáček, Ph.D., Ing. Lukáš Radil, Ph.D., Ing. Stanislav Sumec, Ph.D., Ing. Jan Škoda, Ph.D., Ing. David Topolánek, Ph.D.

Doctoral Students

Ing. Tomáš Bajánek, Ing. Mayada Daboul, Ing. Štěpán Foral, Ing. Miroslav Haluza, Ing. Tomáš Kolacia, Ing. Marek Kopička, Ing. Jan Morávek, Ing. Filip Novotný, Ing. Luděk Ondroušek, Mgr. Mikuláš Parma, Ing. Tomáš Pavelka, Ing. Jiří Pěcha, Ing. Jiří Pitron, Ing. Václav Prokop, Ing. Josef Svoboda, Ing. Miroslav Šajdler, Ing. Martin Štefanka, Ing. Ondřej Šťastný, Ing. Jaroslav Štěpánek, Ing. Jan Varmuža, Ing. Jitka Vojáčková, Ing. Michal Vrána, Ing. Václav Vyčítal, Ing. Kinan Wannous, Ing. Vojtěch Wasserbauer, Ing. Pavel Zdražil, Ing. Miroslav Zeman

Administrative and Technical Staff

Ing. Filip Koval, Ing. Leoš Kukačka, Jitka Langerová, Ing. Lucie Langerová, Josef Němec, Ing. Ladislav Suk, Ing. Josef Šenk, CSc.

Main Interests

The department provides instruction in the Bachelor programme Power Electrical and Electronic Engineering (B-SEE) in cooperation with the Department of Power Electrical and Electronic Engineering, and independently in the Master programme Power Electrical Engineering (M1-EEN). The offered courses deal with conventional and renewable power sources, transmission and distribution of energy, electrical power utilisation in light and heat sources, transient phenomena, solutions of system failures and liberalised energy market

Research is focused on electrical power generation in conditions of sustainable developmenti.e. search for new ways of power generation from renewable sources and increasing operation efficiency of power sources, loss

reduction and fast localisation of network failures, impact of electrical appliances on electric energy quality, exploitation of hydrogen accumulation cycle in solar systems, load optimisation in small variable-output power sources, optimisation of the structure of power sources for services in conditions of liberalised market with electrical energy, technical and technological limits of inter-state power distribution, analysis of major system failures and appropriate measures, analysis of connection into the network, design and implementation of protection systems for indoor and outdoor illumination and evaluation systems.

The department cooperates in research and graduate and postgraduate training with a number of companies, e.g. Skupina E. ON, Skupina ČEZ, ČEPS, a.s., ABB, s.r.o., EGÚ Brno, a.s., KMB Systems s.r.o., MEgA – Měřící Energetické Aparáty, a.s., Teplárny Brno, a.s., Siemens, s.r.o., etc. We have had long-term cooperation in research and instruction with departments of power electrical engineering at all Czech and Slovak technical universities.

A voltage pulse testing system

Major Achievements

The department was involved in research conducted by the 'Centre for Research and Utilisation of Renewable Energy' (CVVOZE). Members of the department' s staff participated in 1 GAČR project, 6 TAČR projects, 1 OP PIK and 37 contract projects. The most significant research project conducted in 2016 was 'Energy in Conditions of Sustainable Development' (ENPUR)funded from National Sustainability Programme I, where the department is responsible for the research part'Generation, Transmission, Distribution and Utilisation of Electrical Energy'.

Research infrastructure of the CVVOZE laboratory (CVVOZEPowerLab) received institutional support from national budget and therefore since 2016 it is partly available to the scientific communinity within the framework of an open access project. Funds were also allocated for the development of infrastructure exploitation for experiments, and for this purpose it is intended to purchase several unique devices in 2017. The department hosted the General Assembly of association DERlab.

In cooperation with Aalto University, of Technology, The University of Edinburgh, Tallinn University of Technology, TU Dresden and five industrial partners we prepared and submitted for H2020 the project 'Enhancing PV Hosting Capacity of Grids by Power Quality Management'.

Cooperation continued with E.ON Česká republika, s.r.o. dealing with issues of electric lines safety in the case of failures and localisation of failures and exploitation of accummulation for operation of the distribution network, with ČEZ Distribuce, a.s a E.ON Distribuce, a.s. a.s. in noise resistance of electrometers in the 2-150kHz band, and Lucis in development of new types of lighting devices. And the department cooperated with Second University of

Naples in quality assessment of electrical energy. We co-organised the international conference 'Electric Power Engineering 2016'.

Major Research Projects

Centre for Advanced Nuclear Technology (CANUT) – TE01020455

Investigator: Karel Katovský

A Modular System for Complex Monitoring and Management in DC and Hybrid AC/DC Smart Networks – TH01020327

Investigator: Jiří Drápela

Elements for Smart Grids Deployment in Distribution Networks – TA04021490

Investigator: Petr Toman

A System of High Voltage Network Protection Using Current and Voltage Sensors with Standardized Digital Output IEC 61850-9-2 - TA03010444

Investigator: Jaroslava Orságová

Development of a Combined Failure Indicator – TA04021491

Investigator: David Topolánek

Knowledge Transfer in the Area of Neutron-Physics Calculations for NPP Safety Analyses– CZ.01.1.02/0.0/0.0/15_013/0004603

Investigator: Karel Katovský

High Energy Heavy Ion Irradiation Effects in SiC and SiC Based Detectors – JINR Dubna, 155/27600

Investigator: Ing. Štěpán Foral

Selected Publications

MARTINEC, J.; KATOVSKÝ, K.; KURWITZ, C. Možnosti akumulace a odvodu tepla pro havarijní události typu LOCA v jaderných elektrárnách. *Bezpečnost jaderné energie. Státní úřad pro jadernou bezpečnost ČR, Úrad jadrového dozoru SR JF DL,* 2016, roč. 24, č. 1, s. 21-27. ISSN: 1210-7085.

ŠKODA, J. Jak vybrat správný světelný zdroj do domácnosti (1. část). *ELEKTRO,* 2016, č. 2/ 2016, s. 22-25. ISSN: 0322-9025.

DRÁPELA, J.; LANGELLA, R.; ŠLEZINGR, J.; TESTA, A. A Tunable Flickermeter to Account for Different Lamp Technologies. *IEEE TRANSACTIONS ON POWER DELIVERY,* 2016, vol. PP, no. 99, p. 1-8. ISSN: 0885-8977.

ŠKODA, J. Jak vybrat správný světelný zdroj do domácnosti (2. část - Dokončení). *ELEKTRO,* 2016, č. 3/ 2016, s. 109-112. ISSN: 0322-9025.

PAVELKA, T.; ŠKODA, J.; BAXANT, P. Historie světelných diod LED. *Světlo,* 2016, roč. 2016, č. 2, s. 26-28. ISSN: 1212-0812.

ŠTEFANKA, M. The Parallel Redundancy Protocol over Wide Area Networks. *Smart Grid and Renewable Energy,* 2016, p. 1-7. ISSN: 2151-4844.

COUFAL, O. Current density in two parallel cylindrical conductors and their inductance. *ELECTRICAL ENGINEERING,* 2016, vol. 98, no. 4, p. 1-5. ISSN: 0948-7921.

KHUSHVAKTOV, J.; ADAM, J.; SOLNYSHKIN, A.; ZEMAN, M.; KOLEKTIV, S. Interactions of secondary particles with thorium samples in the setup QUINTA irradiated with 6 GeV deuterons. *Nuclear Instruments and Methods in Physics Research B,* 2016, no. 381, p. 84-89. ISSN: 0168-583X.

JELÍNEK, M.; KATOVSKÝ, K. Studium nanomateriálů pro jejich použití v jaderné energetice a výzkumu. *Bezpečnost jaderné energie. Státní úřad pro jadernou bezpečnost ČR, Úrad jadrového dozoru SR JF DL,* 2016, roč. 24, č. 9, s. 301-306. ISSN: 1210-7085.

ŠENK, J.; JAKUBOVÁ, I.; LÁZNIČKOVÁ, I. Analysis of Intensively Blasted Electric Arc Burning in the Arc Heater's Anode Channel. *Acta Polytechnica,* 2016, vol. 56, no. 5, p. 395-401. ISSN: 1210-2709.

ŠKODA, J.; BAXANT, P.; SUMEC, S. Pokroky v analýze jasů. *Světlo,* 2016, č. 6/ 2016, s. 45-49. ISSN: 1212-0812.

Bachelor's Courses

Distribuce elektrické energie (doc. Ing. Petr Toman, Ph.D.)	Ochrany a jištění zařízení (doc. Ing. Petr Toman, Ph.D.)
Ekonomika a ekologie elektroenergetiky (Ing. Michal Ptáček, Ph.D.)	Počítače a programování 2 (Ing. Stanislav Sumec, Ph.D.)
Jaderně energetická zařízení (Ing. Karel Katovský, Ph.D.)	Projektování silových a datových rozvodů (Ing. Branislav Bátora, Ph.D.)

Rozvodná zařízení
(doc. Ing. Jaroslava Orságová, Ph.D.)

Strojní zařízení elektráren
(Ing. Karel Katovský, Ph.D.)

Technická mechanika
(doc. Ing. Ilona Lázničková, Ph.D.)

Užití elektrické energie
(doc. Ing. Jiří Drápela, Ph.D.)

Výroba elektrické energie
(doc. Ing. Petr Mastný, Ph.D.)

Výroba a distribuce elektrické energie
(doc. Ing. Petr Toman, Ph.D.)

Master's Courses

Aplikace elektrického oblouku
(doc. Ing. Ilona Lázničková, Ph.D.)

Diagnostika v elektroenergetice
(doc. Ing. Jiří Drápela, Ph.D.)

Distribuční a průmyslové sítě
(Ing. David Topolánek, Ph.D.)

Ekonomika elektroenergetiky
(Ing. Lukáš Radil, Ph.D.)

Elektrárny a teplárny
(doc. Ing. Jaroslava Orságová, Ph.D.)

Elektrické stanice a vedení
(doc. Ing. Jaroslava Orságová, Ph.D.)

Elektrotepelná technika
(doc. Ing. Ilona Lázničková, Ph.D.)

Integrované systémy chránění
(doc. Ing. Petr Toman, Ph.D.)

Jaderné elektrárny
(Ing. Karel Katovský, Ph.D.)

Kvalita elektrické energie a EMC
(doc. Ing. Jiří Drápela, Ph.D.)

Malé zdroje elektrické energie
(doc. Ing. Petr Mastný, Ph.D.)

Nekonvenční přeměny
(Ing. Lukáš Radil, Ph.D.)

Osvětlovací soustavy
(Ing. Jan Škoda, Ph.D.)

Power Systems
(doc. Ing. Petr Baxant, Ph.D.)

Projektování silových a datových rozvodů
(Ing. Branislav Bátora, Ph.D.)

Přechodné jevy
(doc. Ing. Vladimír Blažek, CSc.)

Přenosové sítě
(Ing. Michal Ptáček, Ph.D.)

Řízení elektrizačních soustav
(doc. Ing. Petr Toman, Ph.D.)

Světelná technika
(doc. Ing. Petr Baxant, Ph.D.)

Technika vysokých napětí
(Ing. Michal Krbal, Ph.D.)

Ph.D. Courses

Matematické modelování v elektroenergetice
(doc. Ing. Petr Toman, Ph.D.)

Vybrané problémy z výroby elektrické energie
(doc. Ing. Petr Mastný, Ph.D.)

Laboratories

Laboratory of Electrical Protection (instruction in Distribution Facilities, Electrical Stations and Lines, Protection and Security of Facilities, Integrated Protection Systems, preparation of measurements in real networks, research, Jaroslava Orságová)

Laboratory of Diagnostics (instruction in Diagnostics in Power Electrical Engineering, research on diagnostics and measurement, Jiří Drápela)

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

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

Laboratory of Heating Technology (instruction in Electrical Power Utilisation and Electrical Heating Technology, Ilona Lázničková)

Laboratory of Light and Illumination Technology (instruction in Light Technology, Illumination Systems, Testing of Light Sources and Fittings, research projects, Jan Škoda)

Laboratory of Electrical Networks (instruction in Electrical Power Distribution, Transmission Networks, Electrical Stations and Line Networks, Distribution and Industrial Networks, research projects, Michal Ptáček)

Design Laboratory (instruction in Design of Power and Data Distribution Systems, training and research on modern electroinstallations, Branislav Bátora)

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

Laboratory of Ionising Radiation (instruction in Nuclear Power Facilities, Karel Katovský)

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

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

Ultra High Voltage Laboratories (instruction in Distribution Facilities, Electrical Stations and Lines, High Voltage Technology, testing by superimposed and pulse voltage, Jaroslava Orságová)

Computer Laboratories (2) (instruction in Computers and Programming 1 and 2, planning in power engineering, steady states and transient phenomena in electrification systems, Branislav Bátora)

Final examinations

Department of Electrical and Electronic Technology

doc. Ing. Petr Bača, Ph.D.
Head

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Professors

Prof. Ing. Jiří Kazelle, CSc.
Prof. RNDr. Petr Vanýsek, CSc.
Prof. Ing. Jiří Vondrák, DrSc.

Associate Profesors

doc. Ing. Petr Bača, Ph.D.
doc. Ing. Josef Jirák, CSc.
doc. Ing. Jiří Maxa, Ph.D.
doc. Ing. Vítězslav Novák, Ph.D.
doc. Ing. Marie Sedlaříková, CSc.
doc. Ing. Jiří Vaněk, Ph.D.
doc. Ing. Petr Křivík, Ph.D

Lecturers

Ing. Ondřej Čech, Ph.D., Ing. Martin Frk, Ph.D., Ing. Ladislav Chladil, Ph.D., Ing. Kristýna Jandová, Ph.D., Ing. Tomáš Kazda, Ph.D., Ing. Helena Polsterová, CSc., Ing. Jiří Starý, Ph.D., Ing. Jiří Špinka, Ing. Petr Vyroubal, Ph.D.

Doctoral Students

Ing. Bayer Robert, Ing. Bílek Michal, Ing. Daniel Frýda, Ing. Tomáš Gottwald, Ing. Jiří Hudec, Ing. Josef Hylský, Ing. Michal Jahn, Ing. Kamil Jaššo, Ing. Martin Juračka, Ing. Michl Kadlec, Ing. Miroslav Kunovjánek, Josef Máca, Ing. Michal Musil, Ing. Peroutka Tomáš, Ing. David Pléha, Ing. Marek Solčanský, Ing. Dávid Strachala, Ing. Lucie Šimonová, Ing. Jiří Šubarda, Ing. Jiří Tichý, Ing. Sebastian Vaculík, Ing. Jana Zimáková

Administrative and Technical Staff

Ing. Pavel Čudek, Ph.D., František Chudáček, Ing. Petr Kahle, František Kořínek, Ing. Libich Jiří, Ph.D., Ing. Miroslav Zatloukal, Gabriela Dominiková, Martin Šturm

Main Interests

The department provides instruction in electrotechnical materials, manufacturing processes and their control, printed circuit board and surface mount technology, diagnostics, testing and reliability of electrotechnical materials and processes, quality assurance, designs of systems and alternative electrical power sources in the Bachelor and the Master programme Electrical, Electronic, Control and Communication Technology (EECR), in full-time and part-time form of study. Instruction in the subject Materials and Technical Documentation is provided to all first-year full-time and part-time students in the EECR Bachelor programme.

Research areas of interest are electrotechnical, electronic and optoelectronic materials and components, technologies, diagnostics and prognosis, electron microscopy, electrochemical power sources, lead and alkaline accumulators, development of new materials for lithium-ion batteries, electrocatalysts and ion-exchange membranes for fuel cells, thin-layer electrodes for electrochromic systems, photovoltaic systems, non-destructive diagnostics of defects and quality control,reliability and lifetime of solar cells, detection of signal electrons and methods of environmental scanning electron microscopy of atomic forces, lead-free soldering, quality and reliability of soldered joints, degradation and diagnostics of dielectric systems.

The department cooperates with Technische Universität Wien, Padova University, Universität Ulm – Zentrum für Sonnenenergie und Wasserstoff-Forschung, École Polytechnique de Montréal, surface analysis workplace Nanolytics in Feldkirchen, Austria, Graphite AG Kropfmühl AG, Institute of Scientific Instruments AVČR, Institute of Inorganic Chemistry AVČR, Institute of Physical Chemistry AVČR, Institute of Macromolecular Chemistry AVČR, Bochemie Bohumín, EPRONA Rokytnice nad Jizerou, Elmarco Liberec, Solartec Rožnov pod Radhoštěm, ERD Praha, LINET Slaný, ENERG-SERVIS Brno, ČeMeBo Blansko, Honeywell Brno, ALPS Electric Czech Sebranice. The department also cooperates with INIFTA Universidad Nacional de La Plata, Argentina and Università degli Studi di Palermo, Italy in the programme KONTAKT.

Manufacture of printed circuit boards

Major Achievements

The department co-organised the 37th international conference 'Non-Conventional Energy Sources' in Blansko 18-20 May 2016. The conference was organised in cooperation with the Czech Electrotechnical Society, group for chemical sources of electrical energy.

Members of the department also participated in the meeting of Czech and Slovak colleagues, the 43rd international conference 'Electrotechnology 2016', organised by the department 24-27 May 2016 in Hustopeče.

In August the department organised the 17th international conference 'Advanced Batteries, Accumulators and Fuel Cells', under the auspices of American electrotechnical group International Society of Electrochemistry and BUT Brno. The conference was followed by a workshop sponsored by Metrohm.

The conference was attended by 70 experts from all over the world, e.g. Guenther Fafilek, Tu Wien, Walkoviak, CLAIO Poznaň, Andrea Straková-Fedorková, Pavel Jozef Šafárik University, Košice, Florián Schipper, University Bar Ilan, Tel Aviv, Maciej Swierczynski, University Aalborg, Denmark. An outcome of the conference was a special issue of Transaction of Electrochemical Society, volume 74 with full texts of presented papers (published in Scopus).

A bilateral project of Ministry of Education, Czech Republic – Austria (Vienna Technical University) 'Development of Novel Lithium-ions Batteries for Electrical Energy Storage' was launched. The project included exchange placements for 2 Austrian and 3 Czech academics.

The TAČR project TA 04010085 'Flexible Autonomous Power Systems for Smart Textiles', focused on flexible electrodes for supercapacitors and accumulators entered its third year.

Contracts were concluded on research for RTG Tegler and Pragolab. The department won a NATO international project no. SPS 985148 -'Development of New Cathodes for Stable and Safer Lithium-Sulfur Batteries'.

The department was the chief investigator of the project 'Specific Higher Education Research at BUT' (Materials and Technologies in Electrical Engineering II).

Research continued in the frame of the 'National Sustainability Programme I' for support of research, experimental development and innovations within the framework of the European OP VaVpI project 'Centre for Research and Utilisation of Renewable Energy' (CVVOZE), research programme 2 – 'Chemical and Photovoltaic Energy Sources'.

The Testing Laboratory CVVOZE was re-accredited where the department tests VA characteristics of photovoltaic panels. Verification services for the state and operability of photovoltaic power stations were used by 6 companies and over 70 photovoltaic panels of different types were tested. Results of research and some student theses were presented at one of the most notable European conferences on photovoltaics EU PVSEC 2016 Munchen.

Major Research Projects

Project AKTION Czech Republic – Austria' Ionic Liquids for Intercalation Reactions of Lithium and Sodium Ions in Modern Batteries'

Investigator: Marie Sedlaříková

Project TA04010085 'Flexible Autonomous Power Systems for Smart Textiles'

Investigator: Marie Sedlaříková

ProjectTH02010473'Universal Battery Monitoring Systém – BUMS'

Investigator: Jiří Kazelle

Project 1618BS_CP1 'INVESTIGATION OF THE MUTUAL INTERACTION OF CARBON AND OTHER ADDITIVES IN THE PERFORMACE OF NEGATIVE LEAD ACCUMULATOR ELECTRODES DURING PSoC OPERATION'

Investigator: Petr Bača

Project EUPRO II Participation in Europen Energy Reserch Alliance - EERA) Implementation EUPRO II Project

Investigator: Ladislav Chladil

Selected Publications

VYROUBAL, P.; KAZDA, T.; MAXA, J.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M.; TICHÝ, J.; CIPÍN, R. 3D Modelling and Study of Electrochemical Characteristics and Thermal Stability of Commercial Accumulator by Simulation Methods. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE,* 2016, no. 11, p. 1-13. ISSN: 1452-3981.

STARÝ, J. Tg a TCE – důležité hodnoty pro volbu základního materiálu. *Bulletin of SMT/ISHM Int. Conference "New Trends in Microelectronics",* 2016, č. 79, s. 5-7. ISSN: 1211-6947.

NEDĚLA, V.; HŘIB, J.; HAVEL, L.; HUDEC, J.; RUNŠTUK, J. Imaging of Norway spruce early somatic embryos with the ESEM, Cryo- SEM and laser scanning microscope. *Micron,* 2016, vol. 2016, no. 84, p. 67-71. ISSN: 0968-4328.

SYROVÝ, T.; KAZDA, T.; SYROVÁ, L.; VONDRÁK, J.; KUBÁČ, L.; SEDLAŘÍKOVÁ, M. Cathode material for lithium ion accumulators prepared by screen printing for Smart Textile applications. *Journal of Power Sources,* 2016, no. 309, p. 192-201. ISSN: 0378-7753.

D. Bušek, K. Dušek, D. Růžička, M. Plaček, P. Mach, J. Urbánek, J. Starý. Flux effect on void quantity and size in soldered joints. *Microelectronics Reliability,* 2016, no. 60, p. 135-140. ISSN: 0026-2714.

LIBICH, J.; MÁCA, J.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J. Influence of Approtic Solvents on Negative Electrode Material Properties for Lithium- ion Batteries. *Advances in Military Technology,* 2016, vol. 11, no. 1, p. 5-12. ISSN: 1802-2308.

HUDEC, J.; NEDĚLA, V. Study of Dielectric Properties and Morphology of Epoxy Resin with Silicon Dioxide Microparticles and Nanoparticles. *MICROSCOPY AND MICROANALYSIS,* 2016, vol. 2016, p. 1896-1897. ISSN: 1431-9276.

MICHÁLEK, J.; ABBRENT, S.; MUSIL, M.; KOVÁŘOVÁ, J.; HODAŇ, J.; PLÉHA, D. New type of gel polymer electrolytes based on selected methacrylates and their characteristics. Part II. Fluorinated Co- polymers. *Electrochimica Acta,* 2016, vol. 1, no. 208, p. 211-224. ISSN: 0013-4686.

KAZDA, T.; KRBAL, M.; POUZAR, M.; VONDRÁK, J.; STRAKOVÁ FEDORKOVÁ, A.; SLÁVIK, M.; WÁGNER, T.; MACÁK, J. Highly efficient and stable cryo-ground sulphur cathode for Li- S batteries. *Journal of Power Sources,* 2016, no. 316, p. 293-298. ISSN: 0378-7753.

MAXA, J.; BÍLEK, M.; HLAVATÁ, P.; VYROUBAL, P.; LEPLTOVÁ, K. Comparisons Using Methods of Continuum Mechanics and Monte Carlo at Differentially Pumped Chamber. *Advances in Military Technology,* 2016, vol. 11, no. 2, p. 143-150. ISSN: 1802-2308.

STARÝ, J. Elektromigrace na elektronických sestavách. *Bulletin of SMT/ISHM Int. Conference "New Trends in Microelectronics",* 2016, č. 80, s. 33-36. ISSN: 1211-6947.

KAZDA, T.; VANÝSEK, P. The Chalkboard: Lithium Batteries as Electrochemical Sources of Energy. *Electrochemical Society Interface,* 2016, vol. 2016, no. 3, p. 47-49. ISSN: 1064-8208.

KŘIVÍK, P. Temperature Changes of Lead Acid Battery Cell with Pulse Charging in a Flooded State. *ECS Transaction,* 2016, vol. 74, no. 1, p. 123-130. ISSN: 1938-6737.

Bachelor's Courses

Diagnostika a zkušebnictví
(doc. Ing. Josef Jirák, CSc.)

Elektrotechnické materiály a výrobní procesy
(prof. Ing. Jiří Kazelle, CSc.)

Materiály a komponenty pro biomedicínu
(doc. Ing. Marie Sedlaříková, CSc.)

Materiály a technická dokumentace
(doc. Ing. Josef Jirák, CSc.)

Návrh a konstrukce elektrotechnických zařízení
(doc. Ing. Vítězslav Novák, Ph.D.)

Návrhové systémy plošných spojů
(doc. Ing. Petr Bača, Ph.D.)

Plošné spoje a povrchová montáž
(Ing. Jiří Starý, Ph.D.)

Počítačové projektování výrob, logistika a ekologie výroby (doc. Ing. Jiří Vaněk, Ph.D.)

Počítačová podpora technických a manažerských prací (doc. Ing. Jiří Maxa, Ph.D.)

Řízení a kontrola jakosti
(Ing. Helena Polsterová, CSc.)

Řízení jakosti a metrologie
(Ing. Helena Polsterová, CSc.)

Spolehlivost v elektrotechnice
(Ing. Helena Polsterová, CSc.)

Master's Courses

Alternativní zdroje energie
(doc. Ing. Jiří Vaněk, Ph.D.)

Diagnostické metody v elektrotechnice
(doc. Ing. Josef Jirák, CSc.)

Ekologie výroby
(doc. Ing. Petr Bača, Ph.D.)

Klimatotechnologie
(Ing. Martin Frk, Ph.D.)

Materiály pro biomedicínské aplikace
(doc. Ing. Marie Sedlaříková, CSc.)

Mechanical Desktop
(doc. Ing. Jiří Maxa, Ph.D.)

Montážní a propojovací technologie
(Ing. Jiří Starý, Ph.D.)

Obnovitelné zdroje energie
(Ing. Petr Křivík, Ph.D.)

Počítačové návrhové systémy
(Ing. Vítězslav Novák, Ph.D.)

Properties and Production of Electrotechnic Materials
(doc. Ing. Josef Jirák, CSc.)

Řízení a správa dat
(doc. Ing. Jiří Maxa, Ph.D.)

Spolehlivost a jakost
(Ing. Helena Polsterová, CSc.)

Struktura a vlastnosti materiálů
(prof. Ing. Jiří Kazelle, CSc.)

Technologické projektování a logistika
(doc. Ing. Jiří Vaněk, Ph.D.)

Třírozměrné modelování a simulace
(doc. Ing. Jiří Maxa, Ph.D.)

Výrobní procesy
(prof. Ing. Jiří Kazelle, CSc.)

Základy spolehlivosti elektrotechnických výrob
(Ing. Helena Polsterová, CSc.)

Ph.D. Courses

Elektrotechnické materiály, materiálové soustavy a výrobní procesy (prof. Ing. Jiří Kazelle, CSc.)

Vybrané diagnostické metody, spolehlivost, jakost
(doc. Ing. Josef Jirák, CSc.)

Laboratories

Laboratory of Alkaline Electrochemical Power Sources (research and development of modern alkaline accumulators (Ni-Cd, Ni-MH) and oxygen-hydrogen fuel cells with alkaline or polymer electrolyte, Vítězslav Novák)

Laboratory of Diagnostics of Photovoltaic Panels (testing of photovoltaic panels and systems in precisely defined conditions, Jiří Vaněk)

Laboratory of Diagnostic Methods (diagnostics of materials and testing methods, experiments for semester projects, Bachelor and Master theses, Martin Frk)

Laboratory of Electrical Diagnostic Methods (diagnostic methods in electrical engineering and climatotechnology, experimental measurements of very small currents and diagnostics of electro-insulating fluids, Martin Frk)

Laboratory of Electrode Materials 1,3 (preparation of specimen and electrode mass for Li-ion, Ni-Cd, Ni-MH and Ni-Zn batteries and supercondensors, thin-film deposition by chemical methods, preparation of polymer gel electrolytes, Marie Sedlaříková)

Laboratory of Electrode Materials 2 (research and measurement of materials for electrochemical sources,mainly Li-ion, Ni-Cd, Ni-MH and Ni-Zn batteries, supercondensors and polymer gel electrolytes for Li-pol batteries, Marie Sedlaříková)

Electrometric Measurement Laboratory (diagnostic analysis of the properties of dielectric materials, samples from commercial producers are measured on current measuring devices,Helena Polsterová)

Laboratory of Eletrotechnical Materials 1 (analysis of electrotechnical materials, laboratory exercises for Materials and Technical Documentation, Electrotechnology for FSI,Petr Křivík)

Laboratory of Electrotechnical Materials 2 (computer modelling and measurement of parameters of semiconductor and dielectric materials, instruction in Electrotechnical Materials and Manufacturing, Material Structure and Properties, Martin Frk)

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

Laboratory of Microscopy Techniques (research of systems for detection of signal electrons, specimen observations in scanning electrode microscope under higher pressure in specimen chamber (VP-SEM) and microscope of atomic forces (AFM), Josef Jirák, Pavel Čudek)

Laboratory of Renewable Sources (testing of electrical and mechanical properties of photovoltaic cells, laboratory instruction in Renewable Energy Sources and Alternative Energy Sources, Jiří Vaněk)

Laboratory of Lead-Acid Accumulators 1,2 (research and development of new applications of lead-acid accumulators for hybrid electromobiles and as renewable energy storage, Petr Bača)

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

Laboratory of Soldering (research and development of lead-free soldered connections reliability and surface wettability, instruction in Interconnection and Assembly Technology, Jiří Starý)

Dry box in a department' s laboratory

Department of Physics

Prof. Ing. Lubomír Grmela, CSc.

Head

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Professors

Prof. Ing. Lubomír Grmela, CSc.
Prof. Ing. Pavel Koktavý, CSc., Ph.D.
Prof. RNDr. Ing. Josef Šikula, DrSc.
Prof. RNDr. Pavel Tománek, CSc.

Associate Professors

doc. RNDr. Milada Bartlová, Ph.D.
doc. Ing. Karel Liedermann, CSc.
doc. Mgr. Jan Pavelka, CSc., Ph.D.
doc. Ing. Petr Sedlák, Ph.D.
doc. Ing. Vlasta Sedláková. Ph.D.

Lecturers

Ing. Jitka Brüstlová, CSc., RNDr. Pavel Dobis, CSc., Ing. Vladimír Holcman, Ph.D., Ing. Robert Macků, Ph.D., Ing. Pavel Škarvada, Ph.D.

Research Workers

Ing. Jiří Majzner, Ph.D., Ing. Pavel Tofel, Ph.D.

Doctoral Students

Ing. Adam Gajdoš, Ing. Michal Jurčík, Ing. Pavel Kaspar, Ing. Tomáš Kuparowitz, Ing. Martin Kuparowitz, Ing. Aneta Lontrasová, Ing. Jan Mucha, Ing. Nikola Papež, Ing. Alexander Podshivalov, Ing. Josef Pokorný, Ing. Elena Prokopyeva, Ing. Milan Spohner, Ing. Ondřej Šik, Ing. Ľubomír Škvarenina, Ing. Marek Vondra

Administrative and Technical Staff

Mgr. Naděžda Bogatyreva, Ph.D., Ing. Miloš Chvátal, Ph.D., Ing. Michal Jurčík, Ing. Pavel Kaspar, Ing. Alexandr Knápek, Ph.D., Ing. Elena Prokopyeva, Miroslav Sadovský, Ing. Petr Sadovský, Ph.D., Mgr. Dinara Sobola, Ph.D., Ing. Milan Spohner, Ing. Jiří Šicner, Ph.D., Ing. Ondřej Šik, Ing. Ľubomír Škvarenina, Ing. Tomáš Trčka, Ph.D., Ing. Alena Václavíková, Ing. Marek Vondra, Radimír Vrba

Main Interests

The department provides tuition in Bachelor's courses Physics 1 and Physics 2 (full-time and part-time study), Physics for students of information technology, Physics 1 and 2 for the programme Biomedical Technology and BIoinformatics, Physics for Audio Engineering, and Physics in Electrical Engineering H-AEI (in English for the programme English in Electrical Engineering)and a Physics seminar for FEEC and FIT. The courses offered in the

Master programme included Nanotechnology, Modern Physics, Solid Phase Physics and Non-Destructive Diagnostics, Physics of Dielectrics for FEEC, Interfaces and Nanostructures and Spectroscopic Methods for Non-Destructive Diagnostics (for FEEC) and Optics (for FIT).

Assignments for Physical Practice and multimedia study materials were updated and innovated for instruction in the computer room and for self-study

Research was centred on basic and applied research of the physical parameters of semiconductor and dielectric materials and components and nanosensors. The main areas of interest were noise spectroscopy, local characterisation with nanodistinction, measurement of nonlinearities, design of quality and reliability indicators and dielectric spectroscopy. Outstanding results were achieved in research on the characteristics of acoustic and electromagnetic emission sensors.

The department cooperated with European and Japanese laboratories in the field of noise spectroscopy and nanotechnology, and in research on dielectrics, with American universities in Orlando and Rapid City in nanometrology, and with leading Czech laboratories in the development and enhancement of the parameters of CdTe radiation detectors.

Contract research has been expanding. Our major partners have been the world leaders On Semiconductor, AVX, Kyocera, Smurfit Kappa and Konštrukta Industry, a.s.

Our top laboratory equipment includes electron microscope LYRA with 1 nm distinction, alfa analyser Novocontrol for measurement of dielectric spectra over 12 frequency orders, infrared spectrometer-Nicolet, workstation for experimental study of semiconductor and dielectric samples at low temperatures (up tp 10K), optical spectroscopy by SNOM, spectral analysers of signals for the entire technical frequency band, the automatic meter of characteristics and non- linearities Keithley 4200 and a vacuum system for research on autoemission cathodes in electron microscopy.
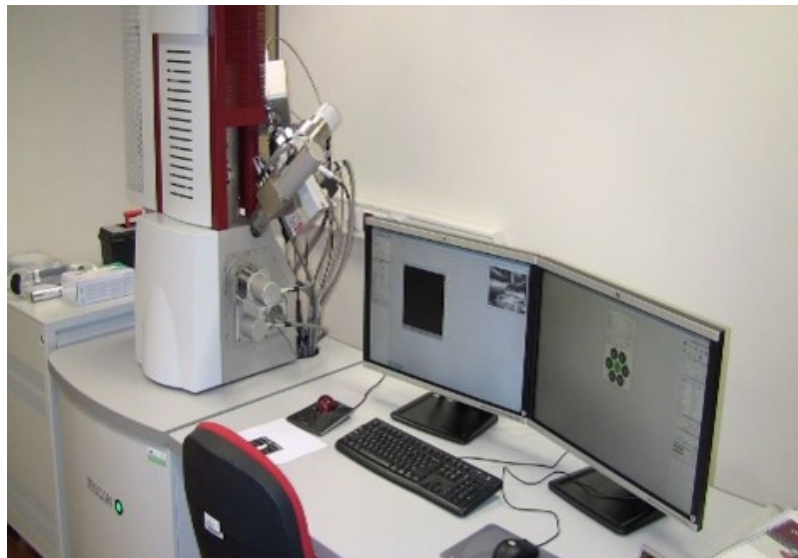
Electron microscope

Major Achievements

The department participated in the Regional Centre for Research and Development CZ.1.05/2.1.00/03.0072 'Centre for Sensor, Information and Communication Systems' (SIX). Two research laboratories were included in the project'Laboratory of Electron Microscopy and Laboratory of Nanometrology'.

The department's staff cooperated in the project CEITEC 2020 (LQ1601) in the frame of the'National Sustainability Programme II'.Project outcomes in 2016 were 6 publications in impact journals, 3 papers in conference proceedings WoS and one research report.

Work was underway on: a GAČR project, a TAČR project, an INWITE project, a H2020 project, an OPPIK project, a specific research project of BUT and 11 economic contracts with industrial companies.

A GAČR project, in cooperation with Charles University Prague, was focused on passivation of emission detector surfaces, a TAČR project, with Třinec Iron and SteelWorks and VŠB Ostrava, involved surface defects of continuously cast billets.

The BUT specific research project deals with the methodology of enhancing the quality of optoelectronic materials and components.

Commercial contracts dealt with temperature measurements in transistors and resistors, monitoring of electromagnetic emission in rocks deformation, solar collectors deformation and methods of detecting small metal particles for analyses in rubber industry.

Major Research Projects

Passivation of CdTe/CdZnTe Surfaces in Emission Detectors – GAČR 15-052595

Investigator: Lubomír Grmela

Enhancement of Surface Quality of Cast Billets– TAČR TA04010312

Investigator at UFYZ : Lubomír Grmela

Interdisciplinary Research on Wireless Technology – LO1401 (INWITE)

Investigators: Lubomír Grmela, Vladimír Holcman

European Consortium for Lithium-Sulphur Power for Space Environments (ECLIPSE) – project H2020

Investigator at UFYZ: Vlasta Sedláková

Development and Innovation of INVYSYS Systems – project OPPIK – CZ.01.1.02/0.0/0.0/15_013/0005044

Investigtor at UFYZ: Lubomír Grmela

Selected Publications

KNÁPEK, A.; SOBOLA, D.; TOMÁNEK, P.; POKORNÁ, Z.; URBÁNEK, M. Field emission from the surface of highly ordered pyrolytic graphite. *Applied Surface Science,* 2016, vol. 2016, no. 12, p. 1-5. ISSN: 0169-4332.

HORVÁTH, T.; JURČÍK, M. Visualization Tool for Control Signalling in NG- PON2. *Journal of Communications Software and Systems,* 2016, vol. 12, no. 1, p. 117-121. ISSN: 1845-6421.

SZEWCZYK, A.; ŠIKULA, J.; SEDLÁKOVÁ, V.; MAJZNER, J.; SEDLÁK, P.; KUPAROWITZ, T. Voltage dependence of supercapacitor capacitance. *METROL MEAS SYST,* 2016, vol. 23, no. 3, p. 403-411. ISSN: 0860-8229.

ŠTOUDEK, R.; TRČKA, T.; MATYSÍK, M.; VYMAZAL, T.; PLŠKOVÁ, I. Acoustic and Electromagnetic Emission of Lightweight Concrete with Polypropylene Fibers. *Materiali in tehnologije,* 2016, vol. 50, no. 4, p. 547-552. ISSN: 1580-2949.

POKORNÝ, J. Technika, která se váže ke standardu IEEE 802. 11. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2016, roč. 18, č. 4, s. 113-118. ISSN: 1213-1539.

SEDLÁKOVÁ, V.; ŠIKULA, J.; MAJZNER, J.; SEDLÁK, P.; KUPAROWITZ, T.; BUERGLER, B.; VAŠINA, P. Supercapacitor degradation assesment by power cycling and calendar life tests. *METROL MEAS SYST,* 2016, vol. 23, no. 3, p. 345-358. ISSN: 0860-8229.

BUŠOV, B.; KATOLICKÝ, Z.; BARTLOVÁ, M. TRIZ and turbojet engine innovation. *Procedia CIRP,* 2016, vol. 40, no. 1, p. 120-126. ISSN: 2212-8271.

BUŠOV, B.; BARTLOVÁ, M.; DOSTÁL, V. TRIZ and innovation of pressing. *Procedia CIRP,* 2016, vol. 40, no. 1, p. 110-113. ISSN: 2212-8271.

ŠIK, O.; BÁBOR, P.; ŠKARVADA, P.; POTOČEK, M.; TRČKA, T.; GRMELA, L.; BELAS, E. Investigation of the effect of argon ion beam on CdZnTe single crystals surface structural properties. *Surface and Coatings Technology,* 2016, vol. 306, no. A, p. 75-81. ISSN: 0257-8972.

SOBOLA, D.; SADOVSKÝ, P.; ŠKARVADA, P.; TOMÁNEK, P. Analýza povrchového reliéfu solárních článků. *Jemná mechanika a optika,* 2016, roč. 11- 12, č. 61, s. 275-276. ISSN: 0447-6441.

SEDLÁK, P.; KUBERSKÝ, P.; ŠKARVADA, P.; HAMÁČEK, A.; SEDLÁKOVÁ, V.; MAJZNER, J.; NEŠPŮREK, S.; ŠIKULA, J. Current- fluctuation measurements of amperometric gas sensors prepared by three different technology procedures. *Metrology and Measurement Systems,* 2016, vol. 23, no. 4, p. 531-543. ISSN: 2300-1941.

KASPAR, P.; PROKOPYEVA, E.; TOMÁNEK, P.; GRMELA, L. Angular absorption of light used for evaluation of structural damage to porcine meat caused by aging, drying and freezing. *MEAT SCIENCE,* 2016, no. 126, p. 22-28. ISSN: 0309-1740.

Bachelor's Courses

Fyzika 1
(RNDr. Pavel Dobis, CSc.)

Fyzika 2
(doc. RNDr. Milada Bartlová, Ph.D.)

Fyzika v elektrotechnice (H-AEI)
(doc. Ing. Karel Liedermann, CSc.)

Fyzika pro audio inženýrství (J-AUD)
(prof. Ing. Pavel Koktavý, CSc., Ph.D.

Fyzika 1 (T-IBP)
(prof. Ing. Lubomír Grmela, CSc.)

Fyzika pro FIT
(prof. Ing. Lubomír Grmela, CSc.)

Fyzikální seminář BFYS
(Ing. Jitka Brüstlová, CSc.)

Fyzikální seminář IFS
(doc. RNDr. Milada Bartlová, Ph.D.)

Master's Courses

Fyzika pevné fáze
(prof. Ing. Pavel Koktavý, CSc., Ph.D.)

Moderní fyzika
(doc. Ing. Karel Liedermann, CSc.)

Fyzikální optika pro informatiky
(doc. Ing. Petr Sedlák, Ph.D.)

Nanotechnologie
(prof. RNDr. Pavel Tománek, CSc., Ing. Pavel Škarvada, Ph.D., Ing. Robert Macků, Ph.D.)

Nedestruktivní diagnostika a fyzika dielektrik
(Ing. Vladimír Holcman, Ph.D.)

Ph.D. Courses

Rozhraní a nanostruktury
(prof. RNDr. Pavel Tománek, CSc.,
        Ing. Robert Macků, Ph.D.)

Spektroskopické metody pro nedestruktivní diagnostiku
        (doc. Ing. Karel Liedermann, CSc.)

Devices for testing of physical properties of components

Laboratories

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

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

Laboratory of Physics (instruction in Physics 1, Physics 2 and Physics for Information Technology, Physics for Audio Engineers, laboratory exercises for Physics of Solids and Non-Destructive Diagnostics of Materials, Semiconductors and Physics of Dielectrics, Pavel Dobis)

Laboratory of Optical Nanometrology – SIX (contactless investigation of local optical and electrical characteristics of optoelectronic and photonic structures with horizontal superresolution by scanning optical near field microscopy, Vladimír Holcman)

Laboratory of Noise Diagnostics (research of fluctuation processes in solids, mainly electronic components, electroinsulation and construction materials, diagnostics of semiconductor components and electroinsulation

materials by partial charges using electromagnetic and acoustic emissions for diagnostics of fissures, Pavel Koktavý)

Laboratory of Electron Microscopy (equipped with the latest electron microscope LYRA with 1nm resolution, Lubomír Grmela)

Laboratory of Noise Dielectric Spectroscopy and Electromagnetic Emission – SIX (experimental and theoretical research of stochastic processes and carrier transport as a basis for novel advanced technologies, nano-sensorics, development of non-destructive diagnostics and modern methods of electronic components and structures service time estimation, Lubomír Grmela)

Department of Languages

doc. PhDr. Milena Krhutová, Ph.D.

Head

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Associate Professor

doc. PhDr. Milena Krhutová, Ph.D.

Lecturers

PaedDr. Alena Baumgartnerová, PhDr. Petra Filová, Ph.D., PhDr. Marcela Borecká, Mgr. et Ing. Eva Ellederová, Kenneth Froehling, M.A., Mgr. Jaromír Haupt, Ph.D., Mgr. Jana Jašková, Ph.D., Ing. Martin Jílek, Mgr. Miroslav Kotásek, Ph.D., Mgr. Petra Langerová, Mgr. Jana Kopecká, Mgr. et Mgr. Hana Mihai, PhDr. Ludmila Neuwirthová, Ph.D., Mgr. Pavel Reich, Ph.D., Mgr. Šárka Rujbrová, Mgr. Pavel Sedláček, PhDr. Milan Smutný, Ph.D., Mgr. Magdalena Šedrlová, Mgr. et Bc. Dagmar Šťastná, Mgr. Agata Walek, Mgr. Petra Zmrzlá, Ph.D., Mgr. Marie Žouželková Bartošová

Administrative and Technical Staff

Miroslava Purová

Main Interests

In 2016 Department of Languages started tuition in all language courses for the Faculty of Management and continued tuition for students of FIT, in addition to language courses for the home faculty. The second group of graduates in the philological study area 'English in Electrical Engineering and Informatics' completed their studies. The department is responsible for the Bachelor programme 'English in Electrical Engineering and Informatics'which provides education in the professional language of various disciplines of electrical engineering and information technology - the theory of linguistics and specific language skills. The programme, unique in the Czech Republic, educates graduates with specific interdisciplinary knowledge and skills required in the current job market. The subjects Introduction in Linguistics, Professional Style in Czech and English, Practical English 1-5, Grammar Structures, Discourse Analysis, Linguistics Pragmatics, Translation Exercises were launched and instruction materials produced. The department provides instruction in professional English for all specialisations in the Bachelor and Master programmes EECR, the Ph.D. programme and the interdisciplinary programmes BT-BIO and AUDIO. The courses are focused on professional English in electrical engineering and information technology, social skills and competences in a professional language.

Research of English as a language of profession continued and its results have been gradually implemented in the teaching materials. Professional discourse analysis considered not only the pragmatic approach, but also the

sociolinguistic approach taking into account the environment where English is spoken as a first or a second language.

Courses of foreign languages and professional English are offered in all study programmes

Major Achievements

The department's activities centred on the Bachelor programme 'English in Electrical Engineering and Informatics', the state examinations and Bachelor theses. This required new instruction materials, rules and regulations for state examinations and choice of study areas. Language courses created for this programme are based on long-term research on the specific discourse in English as a professional language of electrical engineering and information and communication technology. Research outcomes are implemented in the courses and in a highly specific methodology required for this type of instruction. From now on research will also focus on compounds in English for medicine and producers strategies in professional communication.

We created a new system of instruction for the Faculty of Management. Courses English for Business 1 and 2 and Economic English 1 and 2 were launched, new curricula, teaching and examination materials were elaborated.

Some staff members visited universities in Sweden and Germany where they focused on interdisciplinary programmes connecting technical specialisations and professional English.

Selected Publications

REICH, P. Incorporating Linguistics into ESP Courses. CASALC Review, 2016, vol. 2015- 2016, no. 2, p. 85-96. ISSN: 1804-9435.

REICH, P. On the Semantic Structure of American Political Euphemisms. In Jazyk a politika. Na pomedzí lingvistiky a politológie. Bratislava, Slovensko: EKONÓM, 2016. p. 167-181. ISBN: 978-80-225-4292- 0.

Bachelor's Courses

Praktická angličtina
(Mgr. Pavel Sedláček, Mgr et Ing Eva Ellederová, Mgr. Petra Langerová, PhDr. Ludmila Neuwirthová, Ph.D.)

Úvod do lingvistiky
(PhDr. Milan Smutný, Ph.D.)

Angličtina – mluvnická cvičení
(PaedDr. Alena Baumgartnerová)

Jazyk odborného stylu v češtině a angličtině
(Mgr. Miroslav Kotásek, Ph.D.)

Jazyk jako diskurz ve vědě a technice
(doc. PhDr. Milena Krhutová, Ph.D.)

Lingvistická pragmatika
(Mgr. Jaromír Haupt, Ph.D.)

Diskurzní analýza
(Mgr. Petra Zmrzlá, Ph.D.)

Angličtina pro inženýry
(PhDr. Ludmila Neuwirthová, Ph.D.)

Kulturní studia I
(Mgr. Pavel Sedláček)

Kulturní studia II
(Kenneth A.Froehling, M.A.)

Anglictina pro bakaláře- mírně pokročilí 1
(PaedDr. Alena Baumgartnerová)

Anglictina pro bakaláře- mírně pokročilí 2
(PaedDr. Alena Baumgartnerová)

Anglictina pro bakaláře- středně pokročilí 1
(Mgr. Agata Walek)

Anglictina pro bakaláře- středně pokročilí 2
(Mgr. Pavel Sedláček)

Anglictina pro Evropu
(PhDr. Milan Smutný, Ph.D.)

Anglictina pro obchodní praxi
(Mgr. Pavel Reich, Ph.D.)

Etika podnikání
(Ing. Martin Jílek)

Inženýrská pedagogika a didaktika
(Ing. Martin Jílek)

Kultura projevu a tvorba textů
(Ing. Martin Jílek)

Kurs profesní angličtiny pro elektroinženýrství
a informatiku
(PhDr. Milan Smutný, Ph.D.)

Laboratorní didaktika
(Ing. Martin Jílek)

Manažerské účetnictví
(Ing. Martin Jílek)

Němčina pro mírně pokročilé
(Mgr. Pavel Sedláček)

Němčina pro pokročilé
(Mgr. Pavel Sedláček)

Němčina pro začátečníky
(Mgr. Pavel Sedláček)

Pedagogická psychologie
(Ing. Martin Jílek)

Manažerské účetnictví
(Ing. Martin Jílek)

Ruština pro mírně pokročilé
(PaedDr. Alena Baumgartnerová)

Ruština pro začátečníky
(PaedDr. Alena Baumgartnerová)

Španělština pro mírně pokročilé
(PhDr. Marcela Borecká)

Španělština pro začátečníky
(PhDr. Marcela Borecká)

Master's Courses

Anglictina pro Evropu
(PhDr. Milan Smutný, Ph.D.)

Anglictina pro život
(Mgr. Pavel Sedláček, Kenneth Froehling, M.A.)

Etika podnikání
(Ing. Martin Jílek)

Kultura projevu a tvorba textů
(Ing. Martin Jílek)

Kurs profesní angličtiny pro elektroinženýrství
a informatiku(PhDr. Milan Smutný, Ph.D.)

Hospodářská angličtina
(Mgr. Pavel Reich, Ph.D.)

Profesní angličtina
(Mgr. Pavel Reich, Ph.D.)

Manažerské účetnictví
(Ing. Martin Jílek)

Němčina pro mírně pokročilé
(Mgr. Pavel Sedláček)

Němčina pro pokročilé
(Mgr. Pavel Sedláček)

Němčina pro začátečníky
(Mgr. Pavel Sedláček)

Manažerské účetnictví
(Ing. Martin Jílek)

Ruština pro začátečníky
(PaedDr. Alena Baumgartnerová)

Španělština pro začátečníky
(PhDr. Marcela Borecká)

Ph.D. Courses

Anglictina pro doktorandy
(Mgr. Petra Zmrzlá, Ph.D.)

Anglictina pro doktorandy FIT
(doc. PhDr. Milena Krhutová, Ph.D.)

Department of Mathematics

doc. RNDr. Zdeněk Šmarda, CSc.

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Prof. RNDr. Václav Havel, DrSc.

Professors

Prof. RNDr. Josef Diblík, DrSc.
Prof. RNDr. Jan Chvalina, DrSc.

Associate professors

doc. RNDr. Jaromír Baštinec, CSc.
doc. RNDr. Dana Hliněná, Ph.D.
doc. RNDr. Edita Kolářová, Ph.D.
doc. RNDr. Martin Kovár, Ph.D.
doc. RNDr. Zdeněk Šmarda, CSc.

Lecturers

RNDr. Petr Fuchs, Ph.D., Ing. Michal Fusek, Ph.D., Mgr. Irena Hlavičková, Ph.D., RNDr. Vlasta Krupková, CSc., Mgr. Michal Novák, Ph.D., RNDr. Zdeněk Svoboda, CSc., Mgr. Marie Tomšová, Mgr. Jiří Vítovec, Ph.D.

Doctoral Students

Ing. Marie Klimešová, Hanna Demchenko, Mgr. Jan Šafařík, Mgr. Kristýna Mencáková, Ing. Jan Příborský, Mgr. David Staněk, RNDr. Bedřich Smetana, Mgr. Gabriela Vanžurová

Administrative and Technical Staff

Eva Šimečková

Main Interests

Department of Mathematics provided instruction in mathematics in Bachelor and Master full-time and part-time programmes. The department also provided instruction in two Ph.D. courses (Discrete Processes in Electrical Engineering, Probability, Stochastic Processes, Operations Research) and in a number of courses in the Bachelor programme at the Faculty of Information Technology.

Research was conducted on the basis of contracts with international partners - the team of Professor D. Khusainov, Institute of Dynamical System Modelling, Faculty of Cybernetics, Kiev State University, the team ofProfessor I. Dzalladova, Institute of Mathematics, Faculty of Information Systems and Technologies, Kiev National Economic University.

The department cooperates with leading world experts – Professor L. Berezansky, Beer-Sheva University, Israel, Professor S. Stevic, Serbian Academy of Sciences, Belgrade, Professor I. Cristeou, School of Applied Sciences, University of Nova Gorica, Slovenia, Professor Vassilios Tsiantos, Eastern Macedonia and Thrace University of Technology (TEI Kavala), Greece.

Research was focused on the stability of linear delay systems of differential equations, solutions of linear delay and slight delay discrete systems and asymptotic characteristics of delay matrix functions. Research of stochastic differential equations dealt with RLGC circuits with stochastic source and study of differences between parameters of white and coloured noise.

In cooperation with Mendel University and CEITEC we investigated mutual relations and correlations between some oncological biomarkers. We paid attention to two statistical areas of interest – division of extreme values and censored selection.

Hyperstructures created by arranged semigroups were studied based on the theory of automatics and rasters, with the view to simplify creation of hypergroups and connection spaces and describe their chief elements.

Also girls can be interested in mathematics

Major Achievements

The research team dealing with continuous and discrete dynamics participates in the project European Centre of Excellence OP VAVpI CEITEC Central European Technology Institute. Cybernetics for Material Sciences focused on dynamic systems analysis. The team is involved in two GAČR projects and one specific research project.

In the study of dynamic systems, criteria were adopted for existence of positive solutions of differential equations with delay argument as well as existence of two types of positive solutions with different asymptotic behaviour. Existence of positive continuously differentiable solutions was proved for neutral equations. We succeeded in finding representations of delay systems of second-order discrete equationsthrough discrete matrix functions and criteria proving a generally slight delay in a system of linear discrete delay systems.

By comparison of deterministic and stochastic solutions of the RLGC circuit on condition that the source is being affected by white and coloured noise confidence intervals in stochatic solutions were computed. The corresponding stochastic differential equation was posed by incorporating appropriate stochastic processes into its deterministic counterpart and the first two moments of the stochastic process were computed using Ljapunov equations to assess stochastic response dispersion and determine the corresponding confidence interval.

In cooperation with Mendel University and Centre of Excellence CEITEC,we proved that concentration of PSA (prostate specific allergen) in serum largely depends on tumour surface area, while values of urine concentrations of sarcosine correspond to its volume. Using the Brunn-Minkowski theorem and its consequence we could determine the coefficient representing the correlation of tumour surface area and volume.

In 2016 members of the department published 12 papers in impact journals and 34 papers in proceedings of international conferences.

Major Research Projects

Dynamic Systems Identification of Time Scales

Investigator: Josef Diblík

Research of Signal Integrity in High Speed Interconnectors

Co-investigator: Edita Kolářová

Representation of Dynamic Systems Solution, Numerical Algorithms

Chief investigator: Zdeněk Šmarda

Selected Publications

BRANČÍK, L.; KOLÁŘOVÁ, E. Evaluation of Responses in MTL Model Excited from Multiple Stochastic Sources. *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems,* 2016, vol. 5, no. 1, p. 22-28. ISSN: 1805-5443.

DIBLÍK, J.; KHUSAINOV, D.; BAŠTINEC, J.; SIRENKO, A. Exponential stability of perturbed linear discrete systems. *Advances in Difference Equations,* 2016, vol. 2016, no. 2, p. 1-20. ISSN: 1687-1847.

DIBLÍK, J.; KHUSAINOV, D.; BAŠTINEC, J.; SIRENKO, A. Exponential stability of linear discrete systems with constant coefficients and single delay. *APPLIED MATHEMATICS LETTERS,* 2016, vol. 2016, no. 51, p. 68-73. ISSN: 0893-9659.

KHAN, Y.; FARAZ, N.; ŠMARDA, Z. Difference kernel iterative method for linear and nonlinear partial differential equations. *NEURAL COMPUTING & APPLICATIONS,* 2016, vol. 27, no. 3, p. 671-676. ISSN: 0941-0643.

BEREZANSKY, L.; DIBLÍK, J.; SVOBODA, Z.; ŠMARDA, Z. New exponential stability conditions for linear delayed systems of differential equations. *Electronic Journal of Qualitative Theory of Differential Equations,* 2016, vol. 2016, no. 5, p. 1-18. ISSN: 1417-3875.

SVOBODA, Z. REPRESENTATION OF SOLUTIONS OF LINEAR DIFFERENTIAL SYSTEMS OF SECOND-ORDER WITH CONSTANT DELAYS. *Nonlinear Oscillations,* 2016, vol. 19, no. 1, p. 129-141. ISSN: 1562-3076.

BAŠTINEC, J.; DIBLÍK, J.; KHUSAINOV, D.; SIRENKO, A. Stability, unevenly with delay, one of weak linear system with an aftereffect. *Trudy NAN Ukrainy,* 2016, vol. 29, no. 1, p. 129-146. ISSN: 1683-4720.

SIEGMUND, S.; DIBLÍK, J.; NOWAK, C. A generalized Picard- Lindelöf theorem. *Electronic Journal of Qualitative Theory of Differential Equations,* 2016, vol. 2016, no. 68, p. 1-8. ISSN: 1417-3875.

BRANČÍK, L.; KOLÁŘOVÁ, E. Simulation of Multiconductor Transmission Lines with Random Parameters via Stochastic Differential Equations Approach. *SIMULATION- TRANSACTIONS OF THE SOCIETY FOR MODELING AND SIMULATION INTERNATIONAL,* 2016, vol. 92, no. 6, p. 521-533. ISSN: 0037-5497.

STEVIČ, S.; DIBLÍK, J.; IRIČANIN, B.; ŠMARDA, Z. On a Fifth- Order Difference Equation. *JOURNAL OF COMPUTATIONAL ANALYSIS AND APPLICATIONS,* 2016, vol. 20, no. 7, p. 1214-1228. ISSN: 1521-1398.

HOLEŠOVSKÝ, J.; FUSEK, M. Metody analýzy extrémních hodnot a jejich softwarová implementace. *Informační Bulletin Ceské Statistické spolecnosti,* 2016, roč. 27, č. 3, s. 1-13. ISSN: 1210-8022.

KOLÁŘOVÁ, E.; BRANČÍK, L. Comparing white noise and colored noise effects on RLCG electrical circuits. *Acta Electrotechnica et Informatica,* 2016, vol. 16, no. 2, p. 47-51. ISSN: 1335-8243.

HOLEŠOVSKÝ, J.; FUSEK, M.; BLACHUT, V.; MICHÁLEK, J. Comparison of precipitation extremes estimation using parametric and nonparametric methods. *HYDROLOGICAL SCIENCES JOURNAL- JOURNAL DES SCIENCES HYDROLOGIQUES,* 2016, vol. 61, no. 13, p. 2376-2386. ISSN: 0262-6667.

STEVIČ, S.; IRIČANIN, B.; ŠMARDA, Z. Two-dimensional product- type system of difference equations solvable in closed form. *Advances in Difference Equations,* 2016, vol. 2016, no. 253, p. 1-20. ISSN: 1687-1847.

NOVÁK, M.; KŘEHLÍK, Š. Several aspects of generalizing one construction of hyperstructures from quasi-ordered semigroups. *International journal of algebraic hyperstructures and its applications,* 2016, vol. 2 (2015), no. 1, p. 113-124. ISSN: 2383-2851.

CHVALINA, J.; KŘEHLÍK, Š.; NOVÁK, M. Homomorphisms of EL- hyperstructures based on a certain classical transformation. *International journal of algebraic hyperstructures and its applications,* 2016, vol. 2(2015), no. 1, p. 101-112. ISSN: 2383-2851.

CHVALINA, J.; KŘEHLÍK, Š.; NOVÁK, M. Cartesian composition and the problem of generalizing the MAC condition to quasi- multiautomata. *Analele Stiintifice Ale Universitatii Ovidius Constanta, Seria Matematica,* 2016, vol. XXIV, no. 3, p. 79-100. ISSN: 1224-1784.

KŘEHLÍK, Š.; NOVÁK, M. From lattices to H_v - matrices. *Analele Stiintifice Ale Universitatii Ovidius Constanta, Seria Matematica,* 2016, vol. XXIV, no. 3, p. 209-222. ISSN: 1224-1784.

FUSEK, M.; HELLEBRAND, R.; MICHÁLEK, J. Modelling precipitation extremes in the Czech Republic: Update of intensity-duration- frequency curves. *EST J EARTH SCI,* 2016, vol. 65, no. 4, p. 234-247. ISSN: 1736-4728.

Bachelor's Courses

Diskrétní matematika
(doc. RNDr. Martin Kovár, Ph.D.)

Matematický seminář
(RNDr. Petr Fuchs, Ph.D.)

Matematika 1
(doc. RNDr. Edita Kolářová, CSc.)

Matematika 2
(prof. RNDr. Jan Chvalina, DrSc.)

Matematika 3
(Mgr. Irena Hlavičková, Ph.D.)

Pravděpodobnost a statistika
(doc. RNDr. Jaromír Baštinec,CSc.)

Matematika 2 pro audio inženýrství
(RNDr. Zdeněk Svoboda, CSc.)

Vybrané partie z matematiky I.
(doc. RNDr. Zdeněk Šmarda, CSc.)

Vybrané partie z matematiky II.
(doc. RNDr. Zdeněk Šmarda, CSc.)

Matematika v elektrotechnice
(RNDr. Petr Fuchs, Ph.D.)

Master's Courses

Diferenciální rovnice a jejich použití v elektrotechnice
(prof. RNDr. Josef Diblík, DrSc.)

Maticový a tenzorový počet
(doc. RNDr. Martin Kovár, Ph.D.)

Moderní numerické metody
(doc. RNDr. Jaromír Baštinec, CSc.)

Pravděpodobnost, statistika a operační výzkum
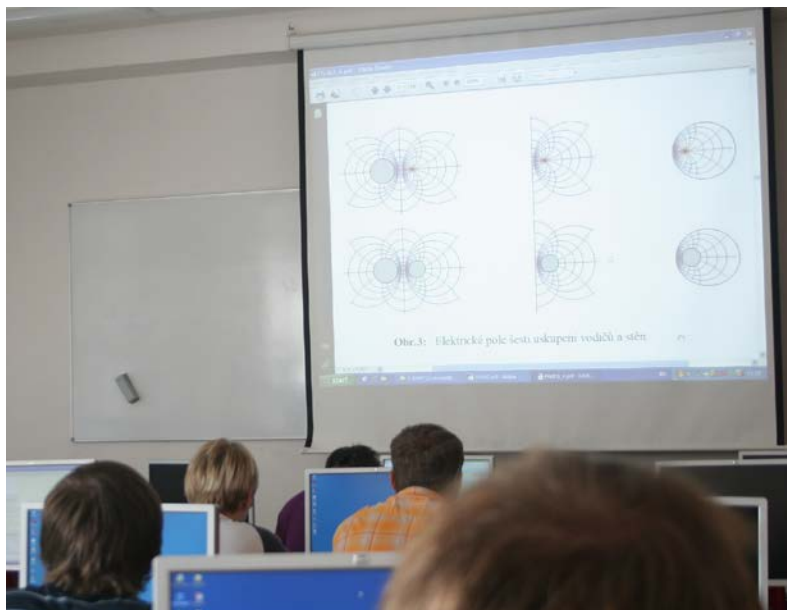(doc. RNDr. Jaromír Baštinec, CSc.)

Náhodné procesy
(doc. RNDr. Jaromír Baštinec,CSc.)

Kódování v informatice
(RNDr. Petr Fuchs, Ph.D.)

Ph.D. Courses

Diskrétní procesy v elektrotechnice
(prof. RNDr. Josef Diblík, DrSc.)

Statistika, stochastické procesy, operační výzkum
(doc. RNDr. Jaromír Baštinec, CSc.)

Instruction in a computer laboratory

Laboratories

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

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

Department of Microelectronics

doc. Ing. Jiří Háze, Ph.D.

Head

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fax: 541 146 298
e-mail: umel@feec.vutbr.cz

Professors

Prof. RNDr. Vojtěch Adam, Ph.D.
Prof. Ing. Dalibor Biolek, CSc.
Prof. Ing. Jaroslav Boušek, CSc.
Prof. Ing. Vladislav Musil, CSc.
Prof. Ing. Radimír Vrba, CSc.

Associate Professors

doc. Ing. Jana Drbohlavová, Ph.D.
doc. Ing. Lukáš Fujcik, Ph.D.
doc. Ing. Jiří Háze, Ph.D.
doc. Ing. Jaromír Hubálek, Ph.D.
doc. Ing. Jaroslav Kadlec, Ph.D.
doc. Ing. Fabian Khateb, Ph.D.
doc. RNDr. Pavel Kopel, Ph.D.
doc. Ing. Radek Kuchta, Ph.D.
doc. Ing. Pavel Legát, CSc.
doc. Ing. Radovan Novotný, Ph.D.
doc. Ing. Josef Šandera, Ph.D.
doc. Ing. Pavel Šteffan, Ph.D.
doc. Ing. Ivan Szendiuch, CSc.
doc. Ing. František Urban, CSc.

Lecturers

Ing. Martin Adámek, Ph.D.,Ing. Edita Hejátková, Ing. Vilém Kledrowetz, Ph.D.,Ing. Michal Pavlík, Ph.D., Ing. Jan Prášek, Ph.D., Ing. Roman Prokop, Ph.D.,Ing. Michal Řezníček, Ph.D., Ing. Ondřej Sajdl, Ph.D., Ing. Martin Šťáva, Ph.D.

Research Workers

M.Sc. Amitava Moulick, Ph.D., Ing. Nabhan Khatib, Ph.D., Ing. Pavel Neužil, Ph.D., Stella Vallejos Vargas, Dr.

Doctoral. Students

Ing. Jaromír Ambrož, Salma Bay Abo Dabbous, Ing. Ondřej Čožík, Ing. Vojtěch Dvořák, Ing. Pavel Hejlek, Ing. Jiří Hofman, Ing. Milan Holík, Ing. Ondřej Chmela, Ing. David Jaroš,Ing. Michal Kerndl, Ing. Martin Klíma, Ing. Stanislav Krátký, Mgr. Zdeňka Kuchtová, Ing. Hana Kynclová, Ing. Radek Lang, Ing. Vladimír Levek,Ing. Ladislav Macháň, Ing. Milan Matějka, Ing. Barbora Mojrová, Ing. Michal Nicák,Ing. Václav Novotný, Ing. Alexandr Otáhal, Ing. Marián Pristach,Ing. Kateřina Přikrylová, Ing. Boleslav Psota,Ing. Karel Ptáček, Ing. Jiří Pulec, Ing. Zdeněk Pytlíček,Ing. Bc. Pavel Řihák, Ing. Jiří Sedláček,Ing. Josef Skácel, Ing. Jakub Somer, Ing. Ladislav Šeliga, Ing.

Radek Vala, Ing. Jan Valíček, Ing. Tomáš Vejmola, Ing. David Veverka, Ing. Doaa Yahya,Ing. Laila Znbill, Ing. Jaromír Žák

Administrative and Technical Staff

Ing. Marek Bohrn, Ph.D., Ing. Martin Buršík, Ph.D., Mgr. Jana Helena Církvová, Ing. Ondřej Frantík, Ph.D., Jarmila Fučíková,Ing. Imrich Gablech, Ing. Radim Hrdý, Ph.D.,Ing. Jaroslav Jankovský, PhDr. Jarmila Jurášová,Jana Karásková, Ing. Petr Kosina, Ph.D., Ing. Ladislav Macháň, Ph.D.,Ing. Petra Majzlíková, Ph.D., Mgr. Eva Martincová, Ph.D.,RNDr. Michal Masařík, Ph.D., Ing. Břetislav Mikel, Ph.D., Bc. David Nejezchleb, Ing. Jan Pekárek, Ph.D., Ing. Jana Pekárková, Ph.D., Mgr. Michaela Pekarová, Petra Procházková DiS, MUDr. Lucie Rajská, Ing. Vojtěch Svatoš, Dr.techn. Ing. Helena Šimůnková, Ying Xu, MBA, Mgr. Ondřej Zítka

Main Interests

The department is responsible for instruction in basic subjects, mainly electronic components and circuits, and subjects specialised in the design of integrated circuits and microelectronic technology in Bachelor and follow-up Master degree programmes.

Basic and applied research was focused on integrated circuits, sensors and microelectronic technologies. The main areas of interest were:

- design of voltage, current and mixed-mode circuits
- design of circuits with switched capacitors and switched currents
- cosmic applications
- basic research of memristors, memcapacitors and meminductors
- MEMS structures design and CoventorWare simulation
- MEMS structures design and CoventorWare simulation
- advanced component, surface and sensor technology
- microelectrodes modified by nanostructures (nanotubes, nanocolumns) using advanced nanotechnologies
- simulation and evaluation of 3D linking systems reliability
- novel methods of thixotropic material nonvacuum deposition in 3D circuits
- reliability of lead-free solders
- advanced methods of semiconductor chips interconnection and packaging
- simulation of electronic kits and packages in ANSYS
- non-conventional application of thick films (sensors, attenuators, shielding, antennas etc).
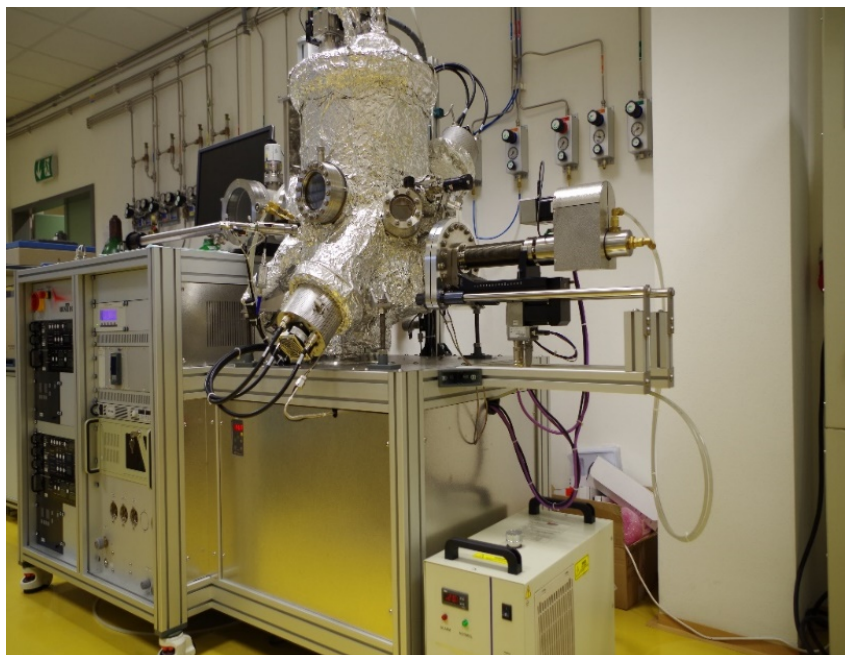
Top-level equipment available at the department

The department closely cooperated (student placements) with Technical University in Sofia (Bulgaria), TU Ilmenau and IMMS Erfurt, Germany, and maintained research cooperation with Autoflug, Hamburg, Catalonia University Rovira i Virgili in Tarragona, research laboratory IMEC-KHBO in Belgium, UC Berkeley, UC San Diego, Politecnico Di Torino, and TU Dresden.

With Pbt Rožnov pod Radhoštěm, the department worked on new cleaning methods in electronics directly related to manufacture of modern cleaning equipment (with focus on cleaning after soldering and cleaning of templates).Prototypes of sensors developed on the principle of balance thermodynamics (cooperation with HIT s.r.o.) were tested. In cooperation with TU Wien new types of flow sensors were implemented by the LTCC.

With Fill Factory, Rožnov pod Radhoštěm (former Solartec) and research centre ISC Konstanz, we started research on the effect of the surface structure of crystalline quartz cells on their properties. The department closely cooperates with the Centre of Excellence CEITEC.

Major Achievements

The department's staff participated in 3 projects of the 7FP European programmes ARTEMIS JU and ENIAC JU, 3 GAČR, 3 MPO and 1TAČR project. In November the department co-organised the international IMAPS flash Conference with participation of Czech and international experts. There were 60 papers on microelectronics and technology.

The group involved in microelectronic technology and casting headed by M. Řezníček and the company REHM (Dr. Bell) focused on lead-free solders and the influence of controlled atmosphere on the service life and long-term reliability of lead-free soldered connections. Cooperation with Pbt Rožnov and manufacturing companies in the TAČR project on cleaning methods continued in compliance with the requirements of environmental management. Another area of interest was modelling of thermal stress in soldered connections and packaging in ANSYS, including contacting and modelling ofsemiconductor chip connections. Cooperation with industrial partners started. Design of a unique balance sensor conducted in the frame of a MPO project was completed. Prototypes were tested in industrial applications, and results were presented on Web of Science (ISI). The project 'Board on Board' (EU Euripides) supervised by the French company Thales centred on a new type of substrates on the basis of printed circuit boards in 3D configuration.

The group focused on microelectronic technology and casting headed by M.Řezníček provided instruction in subjectsBMTS, MMTE, MVSK, MEP for full-time students and another two subjects for part-time students. The group dealt with several topics, namely deposition of viscose materials in very high resolution. This research area was the core of the TAČR GAMA project conducted in 2016. An outcome was patent application relating to the system of maintaining constant distance of deposition capillary from substrate surface. The project 'Board on Board' conducted in the frame of programme Euripides was completed in 2016. Another research area was melting of ceramic materials forceramic casing implementation. The group was involved in mount and repair of BGA casting including the impact of residual oxygen concentrationin atmosphere during alloy remelting. A novel method of peening on two-layer printed circuit boards using ultrasound energy and vacuum was developed. Experiments to study the impact of moisture on the reliability of electronic components and circuits were conducted. An interesting and unconventional area is the monitoring of the fermentation process of milk products by means of thermodynamic sensors. Research results were presented at conferences ISSE Plzeň, IMAPS flash Conference, MSMF Brno and Student EEICT. Papers were published in journals Periodica Polytechnika Electrical Engeneering and Computer Science andPotravinárstvo.

The group LabSensNano (Laboratory of microsensors ans nanotechnology) led by J. Hubálek continued its engagement in the centre SIX and Central European Technology Institute. The team was involved in research and development of physical and chemical sensors and biosensors for medical, environmental and specific applicatons using micro- and nanotechnologies. They received a patent for novel methods of bolometer construction based on MEMS technology sensitive even to remote IR radiation and incorporated in sensor cameras. Lab on a chip technology for ultra-fast analysis in mobile devices continued. Technology for creating 3D sensitive nanostructured gas sensors was developed. Research outcomes were published in impact journals and presented at Web of Science (ISI) conferences.

The team working on custom integrated circuits led by L. Fujcik focused on the development of intelligent submicron structures and systems for modern microsensors and low-input and low-voltage applications. An integrated circuit for basic evaluation circuit (future building block of a line evalution system) was designed for measurement of temperature changes in resistivity of a bolometer sensor working as an integrator based on the principle of $\Delta\Sigma$ modulation. The integrated circuit has been designed to evaluate the change in bolometer resistivity due to heating by incident infrared radiation. This structure was patented and then published in impact journals. In the last years the group for design of custom integrated circuits has become involved in the development of devices for use in the space, mainly smaller devices able to affect significantly certain key functions of space satellites. We are currently involved inthe project METOP SG 3MI where we are developing all electronics, from power components to signal processing, control and automation of engine. It is an optical experiment for monitoring of the surface area of earth, climate, atmospheric temperature and moisture. A new generation of meteo satellite is being developed to provide high quality data on climate development. These are projects of the European space agency (ESA). They are very complex and require high technical competence, therefore many European top teams are involved, and we closely cooperate with them. A joint team of the department and companies CROSS Zlín and NETWORK GROUP, s.r.o. continued development of a novel sensor for the system of dynamic weighing of

vehicles. Research focused on low pressure and vacuum pressure sensor. With other partners we worked on wireless network and communication protocols. The key objective of this cooperation was the development of reliable identification systems based on wireless technology from MICRORISC s.r.o

Research led by Professor Biolek continued within the framework of GAČR 14-19865S and COST LD15033 projects and focused on memsystems, particularly memristors. In cooperation with Technical University Dresden, NamLab Dresden and HP laboratories in Palo Alto, USA, models of TiO2 and NbO memristors produced in Brno were characterised and optimised for simulation of extremely extensive memristor networks emulating neuro-morphological systems for massive analog parallel computations. Experiments revealed complex nonlinear dynamics of these systems. Theoretical processing led to formulation of new circuit theorems. Results were published in prestigious impact journals.

Major Research Projects

DeNeCoR Devices for Neurocontrol and Neurorehabilitation – ENIAC JU Project 7H13014 (FP7)

Investigator: Radimír Vrba

Theory and Application of Memristors – LD15033, MŚMT project

Investigator: Dalibor Biolek

Microfuidics-Based Ultrafast Differential Fluometry for Pharmaceutical Research (µDSF) – GAČR 16-11140S

Investigator: Jaromír Hubálek

Research and Development of Novel Analog Integrated Circuit Principles for Implementable and Portable Battery Operated Biomedical Devices - GA15-21942S

Investigatior: Fabian Khateb, Ph.D

Nanotechnology-Based Universal Surveillance Camera – VI20152019043

Investigator: Jaromír Hubálek

Selected Publications

OTÁHAL, A.; SZENDIUCH, I.; ŠIMEK, V.; CRHA, A.; RŮŽIČKA, R. Inovace procesu pokovení průchozích otvorů v DPS. *DPS Elektronika od A do Z,* 2016, č. 1/ 2016, s. 2-3. ISSN: 1805-5044.

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CHMELA, O.; VALLEJOS VARGAS, S.; HUBÁLEK, J. Chemoresistive micromachined gas sensors based on functionalized metal oxide nanowires: performance and reliability. *Sensors and Actuators B: Chemical,* 2016, no. 235, p. 525-534. ISSN: 0925-4005.

MOURALOVÁ, K.; ZAHRADNÍČEK, R.; HOUŠKA, P. Evaluation of surface quality of X210CR12 steel for forming tools machined by WEDM. *MM Science Journal,* 2016, vol. 2016, no. 4, p. 1366-1369. ISSN: 1803-1269.

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Bachelor's Courses

Analogové elektronické obvody
(prof. Ing. Dalibor Biolek, CSc.)

Diagnostika a testování elektronických systémů
(Ing. Michal Pavlík, Ph.D.)

Digitální obvody
(doc. Ing. Lukáš Fujcik, Ph.D.)

Digitální obvody a mikroprocesory - HDOM
(doc. Ing. Pavel Šteffan, Ph.D.)

Analogová technika – HANA
(Ing. Vilém Kledrowetz, Ph.D.)

Elektronické součástky - BESO, HESO
(prof. Ing. Jaroslav Boušek, CSc.)

Návrh vakuových soustav pro technologie
v mikroelektronice(doc. Ing. Josef Šandera, Ph.D.)

Mikroelektronické praktikum
(doc. Ing. Josef Šandera, Ph.D.)

Mikroelektronika a technologie součástek
(doc. Ing. Ivan Szendiuch, CSc.)

Mikrosenzory a mikromechanické systémy
(doc. Ing. Jaromír Hubálek, Ph.D.)

Modelování a počítačová simulace
(prof. Ing. Dalibor Biolek, CSc.)

Návrh a konstrukce elektronických přístrojů
(prof. Ing. Vladislav Musil, CSc.)

Návrh analogových integrovaných obvodů
(doc. Ing. Jiří Háze, Ph.D.)

Optoelektronika a optické komunikace
(doc. Ing. František Urban, CSc.)

Podnikatelské minimum
(doc. Ing. Pavel Legát, CSc.)

Master's Courses

Analogové integrované obvody
(doc. Ing. Jiří Háze, Ph.D.)

Aplikovaná počítačová technika
(Ing. Radovan Novotný, Ph.D.)

Digitální integrované obvody
(doc. Ing. Pavel Šteffan, Ph.D.)

Integrovaná optoelektronika
(doc. Ing. František Urban, CSc.)

Konstrukce a technologie elektronických zařízení
(prof. Ing. Vladislav Musil, CSc.)

Metody návrhu analogových integrovaných obvodů
(Ing. Roman Prokop, Ph.D.)

Metody návrhu digitálních integrovaných obvodů
(doc. Ing. Lukáš Fujcik, Ph.D.)

Microelectronics in English
(doc. Ing. Jiří Háze, Ph.D.)

Mikroelektronické prvky a struktury
(prof. Ing. Vladislav Musil, CSc.)

Modelování a simulace v mikroelektronice
(doc. Ing. Jaroslav Kadlec, Ph.D.)

Moderní technologie elektronických obvodů
a systémů (doc. Ing. Ivan Szendiuch, CSc.)

Návrh elektronických přístrojů
(doc. Ing. Radek Kuchta, CSc.)

Nové obvodové principy pro návrh integrovaných
systémů (doc. Ing. Fabian Khateb, Ph.D.)

Podnikatelské minimum
(doc. Ing. Pavel Legát, CSc.)

Praktické minimum podnikatele
(doc. Ing. Pavel Legát, CSc.)

Řízení jakosti
(Ing. Radovan Novotný, Ph.D.)

Teorie vzájemného převodu analogového
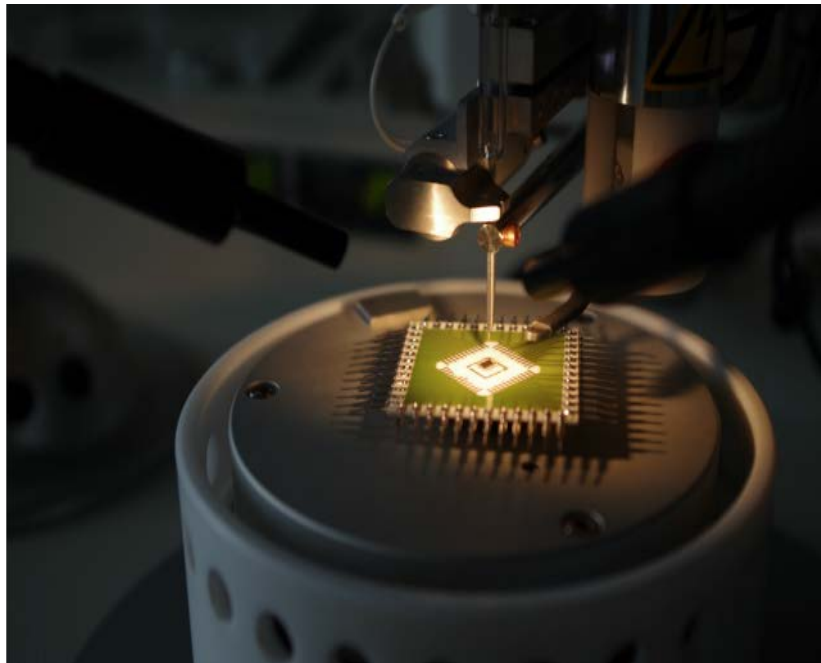a číslicového signálu(doc. Ing. Jiří Háze, Ph.D.)

Vakuová technika
(prof. Ing. Jaroslav Boušek, CSc.)

Výroba součástek a konstrukčních prvků
(doc. Ing. Ivan Szendiuch, CSc.)

Ph.D. Courses

Mikroelektronické systémy
(prof. Ing. Vladislav Musil, CSc.)

Mikroelektronické technologie
(doc. Ing. Jaromír Hubálek, Ph.D

Design and testing of custom integrated circuits

Laboratories

Laboratory of Electronic Components (instruction in Electronic Components, Petr Kosina, Jaroslav Boušek). New measuring devices wereprovided by ON Semiconductor.

Laboratory of Analog Circuits and Microelectronic Practice (instruction in Analog Integrated Circuits and Microelectronic Practice, Jiří Háze, Josef Šandera)

Laboratory of Microsensors and Nanotechnologies (research laboratory of chemistry, chemical sensors and biosensors, development of electronic devices, electron microscopy and lithography, dispersive X-ray spectroscopy, Jaromír Hubálek)

Laboratory of Microelectronic Mount Technology and Casing (thick films, solder surface mount, lead-free soldering andcasing, instruction in Microelectronics and Component Technology, Manufacturing of Components and Construction Elements, Modern Technology of Electronic Circuits and Systems, student projects, Ivan Szendiuch)

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

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

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

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

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

Computer Laboratory (computer exercises for various subjects, self-study, Internet, David Nejezchleb)
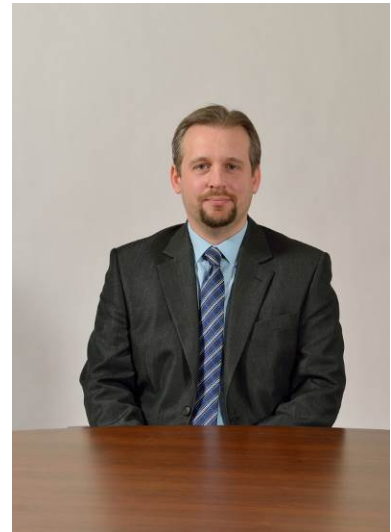
Laboratory for Semiconductor Components Characterisation – Testing of Chips (instruction in Manufacturing of Components and Construction Elements, student projects, Jaromír Hubálek)

Department of Radioelectronics

Prof. Ing. Tomáš Kratochvíl, Ph.D.

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Prof. Ing. Václav Říčný, CSc.
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Professors

Prof. Ing. Lubomír Brančík, CSc.
Prof. Ing. Stanislav Hanus, CSc.
Prof. Ing. Miroslav Kasal, CSc.
Prof. Dr. Ing. Zdeněk Kolka
Prof. Ing. Tomáš Kratochvíl, Ph.D.
Prof. Ing. Roman Maršálek, Ph.D.
Prof. Ing. Aleš Prokeš, Ph.D.
Prof. Dr. Ing. Zbyněk Raida
Prof. Ing. Milan Sigmund, CSc.
Prof. Ing. Otakar Wilfert, CSc.

Associate Professors

doc. Ing. Tomáš Frýza, Ph.D.
doc. Ing. Jaroslav Láčík, Ph.D.
doc. Ing. Jiří Petržela, Ph.D.
doc. RNDr. Jitka Poměnková, Ph.D.
doc. Ing. Martin Slanina, Ph.D.
doc. Ing. Jiří Šebesta, Ph.D.

Lecturers

Ing. Viera Biolková, Ing. Jiří Dřínovský, Ph.D., Ing. Lucie Hudcová, Ph.D., Ing. Ivana Jakubová, Ing. Michal Kubíček, Ph.D., Ing. Martin Štumpf, Ph.D., Ing. Tomáš Urbanec, Ph.D.

Research Workers

Ing. Jiří Blumenstein, Ph.D., Ing. Libor Boleček, Ph.D., Dr. Techn. Vojtěch Derbek, doc. Ing. Pavol Galajda, CSc., Ing. Tomáš Götthans, Ph.D., Ing. Milan Guzan, Ph.D, Dr. Aniruddha Chandra, Ing. Petr Kadlec, Ph.D., prof. Dr. Ing. Christoph Mecklenbräuker, Ing. Tomáš Mikulášek, Ph.D., Ing. Jiří Miloš, Ph.D., Ing. Ladislav Polák, Ph.D., Ing. Aleš Povalač, Ph.D., Ing. Jan Puskely, Ph.D., Ing. Vladimír Šeděnka, Ph.D., Ing. Roman Šotner, Ph.D., ing. Filip Záplata, Ph.D.

Doctoral Students

Ing. Nawfal Al-Zubaidi R-Smith, Ing. Peter Barcík, Ing. Miroslav Cupal, Ing. Vojtěch Dluhý, Ing. Aleš Dobesch, Ing. Ondřej Domanský, Ing. Michal Harvánek, Ing. Martin Hrabina, Ing. Patrik Hubka, Ing. Lukáš Janík, Ing. Ondřej Kaller, Ing. Aslihan Kartci, Ing. Eva Klejmová, Ing. Martin Kokolia, Ing. Martin Kotol, Ing. Jan Král, Ing. Daniel Kresta, Ing. David Krutílek, Ing. Zenon Kuder, MSc., Ing. Jan Kufa, Ing. Pavel Kukolev, Ing. Lukáš Langhammer, Ing. Demian Lekomtcev, Ing. Tobiáš Malach, Ing. Martin Marek, Ing. Roman Mego, Ing. Michal

Mrnka, Ing. Lenka Nagyová, Ing. Marek Novák, Ing. Martin Pospíšil, Ing. Miroslav Staněk, Ing. Petr Sedláček, Ing. Jan Špůrek, Ing. Petr Vašina, Ing. Jan Vélim, Ing. Josef Vychodil, Ing. Dominika Warmowska, Ing. Ondřej Zach

Administrative and Technical Staff

Ing. Josef Báňa, Ing. Philip Bělohlávek, Bohuslava Raidová, Petra Šípová, Aleš Vanžura, Jaroslav Voráč

Main Interests

Research is focused on modern electronic circuits, novel signal processing methods, microwave circuits and antennas. Our areas of interest are mobile, satellite and optical communications, digital television technology and video technology, microprocessor technology, low-frequency and audio electronics, and electromagnetic compatibility (EMC).

Research was financed through 5 projects of Czech Science Foundation (GA ČR) and 5 projects of the Technology Agency of the Czech Republic (TA ČR). The department was involved in a project of Ministry of Industry and Trade (MPO ČR) and 3 internal grants of Brno University of Technology.

The department participated in 2 European projects FP7 STREP and CATRENE EU, 3 projects of international cooperation COST, 1 SoMoPro project of the South Moravian Centre for International Mobility, and cooperated in contracts for leading international partners (Volkswagen) and nearly 20 direct contracts for Czech companies (Škoda Auto, URC Systems, ERA, CSRS, PBS etc.

We cooperate with many professionalorganisations and societies.Staff members are engaged in the committee of the Czech and Slovak section of IEEE and Radioengineering Society.There has been active cooperation with the Czech Electrotechnical Society.The department supports activities of the Student Section of IEEE at Brno University of Technology and Radioclub OK2KOJ, and is a collective member of the international organisation AMSAT.
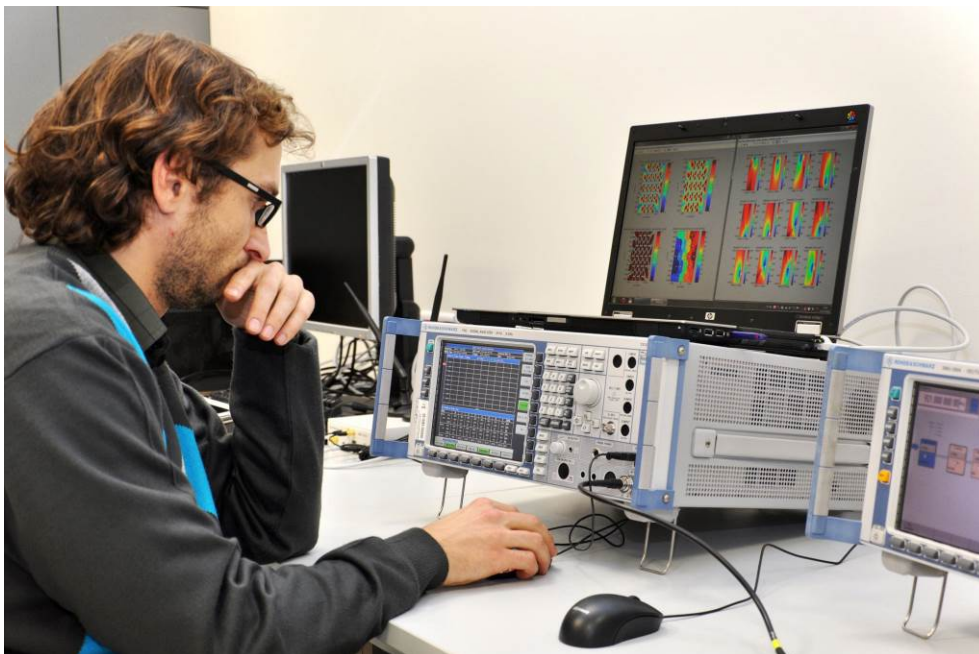
Devices for signal analysis

Major Achievements

The department participates, in cooperation with Departments of Telecommunications, Microelectronics, Theoretical and Experimental Electrical Engineering and Physics, in the regional 'Centre of Applied Research SIX' (Centre of Sensor, Information and Communication Systems). Research teams of the centre's two sections – microwave technology and wireless technology – joined several TA ČR applied research projects, and projects of the European Agency CATRENE.

In 2016 the department joined three international activities COST (IC1407 Advanced Characterisation and Classification of Radiated Emissions in Densely Integrated Technologies (ACCREDIT), IC1105 3D Content Creation, Coding and Transmission over Future Media Networks (3D-ConTourNet) and IC1305 Network for Sustainable Ultrascale Computing (NESUS).

The department was involved in national basic and applied research projects, in the international project H2020 ADWICE (Advanced Wireless Technologies for Clever Engineering), CATRENE CORTIF (Coexistence of RF Transmissions in the Future) and FP7 STREP nanoCOPS (Nanoelectronic Coupled Problems Solutions).

Cooperation with Volkswagen AG, Germany continued as well as national cooperation withŠkoda Auto, URC Systems, ERA, CSRS, PBS, etc.

Research results are immediately incorporated in the curricula of the Bachelor, Master and Ph.D. study area Electronics and Communications.

Major Research Projects

Advanced Wireless Technologies for Clever Engineering (ADWICE) – European project H2020-WIDESPREAD-2014-1 no. 662140

Investigator: Zbyněk Raida

Nanoelectronic Coupled Problems Solutions (nanoCOPS) – European project FP7 STREP no. 619166

Investigator:Tomáš Kratochvíl

Coexistence of RF Transmissions In the Future (CORTIF) – European project CATRENE no. CA116

Investigator: Tomáš Kratochvíl

Research into WirelessC for Intra-Vehicle Communication and Positioning – GA ČR no. 13-38735S

Investigator: Aleš Prokeš

Set of Elements for Photonics Communication – TA ČR no. TH01011254

Investigator: Zdeněk Kolka

Selected Publications

BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z.; DOBEŠ, J. Analog Emulator of Genuinely Floating Memcapacitor with Piecewise- Linear Constitutive Relation. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2016, vol. 35, no. 1, p. 43-62. ISSN: 0278-081X.

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KALLER, O.; BOLEČEK, L.; POLÁK, L.; KRATOCHVÍL, T. Depth Map Improvement by Combining Passive and Active Scanning Methods. *Radioengineering,* 2016, vol. 25, no. 3, p. 536-547. ISSN: 1210-2512.

KUFA, M.; RAIDA, Z.; MATEU, J. Three- element filtering antenna array designed by the equivalent circuit approach. *IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION,* 2016, vol. 64, no. 9, p. 3831-3839. ISSN: 0018-926X.

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POLÁK, J.; JEŘÁBEK, J.; LANGHAMMER, L.; ŠOTNER, R.; DVOŘÁK, J.; PÁNEK, D. DIGITALLY CONTROLLABLE CURRENT AMPLIFIER AND CURRENT CONVEYORS IN PRACTICAL APPLICATION OF CONTROLLABLE FREQUENCY FILTER. *Journal of Electrical Engineering,* 2016, vol. 67, no. 4, p. 261-266. ISSN: 1335-3632.

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PACHMÁŇ, J.; KUNZEL, M.; KUBÁT, K.; ŠELEŠOVSKÝ, J.; MARŠÁLEK, R.; KUBÍČEK, M.; POSPÍŠIL, M.; PROKEŠ, A. OPTIMEX: Measurement of Detonation Front Curvature with a Passive Fiber Optical System. *Central European Journal of Energetic Materials,* 2016, vol. 13, no. 4, p. 807-820. ISSN: 1733-7178.

SIGMUND, M.; BRANČÍK, L. Requirements on Needed Frequency Bandwidth Depending on Pulse Waveforms and their Allowed Distortion. *Journal of Electrical Engineering,* 2016, vol. 67, no. 6, p. 459-462. ISSN: 1335-3632.

JEŘÁBEK, J.; ŠOTNER, R.; POLÁK, J.; VRBA, K.; DOSTÁL, T. Reconnection- Less Electronically Reconfigurable Filter with Adjustable Gain Using Voltage Differencing Current Conveyor. *Elektronika Ir Elektrotechnika,* 2016, vol. 22, no. 6, p. 39-45. ISSN: 1392-1215.

SEDLÁČEK, P.; SLANINA, M.; KOVÁČ, D. An Overview of Indoor and Outdoor Positioning Technologies with Focus on their Precision. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2016, vol. 18, no. 6, p. 183-192. ISSN: 1213-1539.

Bachelor's Courses

Analogové elektronické obvody
(prof. Ing. Lubomír Brančík, CSc.)

Elektromagnetická kompatibilita
(Ing. Jiří Dřínovský, Ph.D.)

Elektromagnetické vlny, antény a vedení
(prof. Dr. Ing. Zbyněk Raida)

Elektronické praktikum
(Ing. Ivana Jakubová)

Impulzová a číslicová technika
(doc. Ing. Tomáš Frýza, Ph.D.)

Komunikační systémy
(prof. Ing. Aleš Prokeš, Ph.D.)

Mikroprocesorová technika a embedded systémy
(doc. Ing. Tomáš Frýza, Ph.D.)

Mikrovlnná technika
(doc. Ing. Jaroslav Láčík, Ph.D.)

Moderní bezdrátová komunikace
(doc. RNDr. Jitka Poměnková, Ph.D.)

Napájení elektronických zařízení
(Ing. Michal Kubíček, Ph.D.)

Návrh analogových filtrů
(doc. Ing. Jiří Petržela, Ph.D.)

Nízkofrekvenční a audio elektronika
(prof. Ing. Tomáš Kratochvíl, Ph.D.)

Počítače a programování 1
(doc. Ing. Jiří Šebesta, Ph.D.)

Počítače a programování 2
(doc. Ing. Jiří Šebesta, Ph.D.)

Počítačové řešení elektronických obvodů
(prof. Dr. Ing. Zdeněk Kolka)

Počítačové řešení komunikačních subsystémů
(Ing. Petr Kadlec, Ph.D.)

Rádiové a mobilní komunikace
(prof. Ing. Stanislav Hanus, CSc.)

Rádiové přijímače a vysílače
(prof. Ing. Aleš Prokeš, Ph.D.)

Signály a soustavy
(prof. Ing. Milan Sigmund, CSc.)

Vysokofrekvenční technika
(Ing. Tomáš Urbanec, Ph.D.)

Základy optických komunikací a optoelektronika
(Ing. Lucie Hudcová, Ph.D.)

Základy televizní techniky
(prof. Ing. Stanislav Hanus, CSc.)

Master's Courses

Advanced radio communication systems
(doc. RNDr. Jitka Poměnková, Ph.D.)

CAD v mikrovlnné technice
(prof. Dr. Ing. Zbyněk Raida)

Digitální televizní a rozhlasové systémy
(prof. Ing. Tomáš Kratochvíl, Ph.D.)

Kvantová a laserová elektronika
(Ing. Lucie Hudcová, Ph.D.)

Mikrokontrolery pro pokročilé aplikace
(Ing. Aleš Povalač, Ph.D.)

Návrh antén a rádiových spojů
(doc. Ing. Jaroslav Láčík, Ph.D.)

Počítačové a komunikační sítě
(prof. Dr. Ing. Zdeněk Kolka)

Mikroprocesory s architekturou ARM
(Ing. Aleš Povalač, Ph.D.)

Programovatelné logické obvody
(Ing. Michal Kubíček, Ph.D.)

Radiofrekvenční identifikace
(Dr. Techn. Vojtěch Derbek)

Radioelektronická měření
(Ing. Jiří Dřínovský, Ph.D.)

Radiolokační a radionavigační systémy
(doc. Ing. Jiří Šebesta, Ph.D.)

Směrové a družicové spoje
(prof. Ing. Miroslav Kasal, CSc.)

Softwarové rádio
(prof. Ing. Roman Maršálek, Ph.D.)

Systémy mobilních komunikací
(doc. Ing. Martin Slanina, Ph.D.)

Teorie elektronických obvodů
(doc. Ing. Jiří Petržela, Ph.D.)

Teorie rádiové komunikace
(prof. Ing. Roman Maršálek, Ph.D.)

Videotechnika a multimediální technika
(doc. Ing. Martin Slanina, Ph.D.)

Ph.D. Courses

Moderní digitální bezdrátová komunikace
(prof. Ing. Milan Sigmund, CSc.)

Návrh moderních elektronických obvodů
(prof. Dr. Ing. Zdeněk Kolka)

Laboratories

Laboratory of Analog Electronic Circuits (instruction in analog electronics, Ivana Jakubová, Lubomír Brančík, Jiří Petržela, Roman Šotner)

Laboratory of Electromagnetic Compatibility EMC (research and instruction in EMC and pre-certifying tests of interference and resistance according to European norms, Jiří Dřínovský)

Laboratory of Low-Frequency Applications (research and instruction in audio technology,low-frequency electronics and power supply systems for electronic devices, Tomáš Kratochvíl, Michal Kubíček)

Laboratory of Signals and Digital Technology (research and instruction in signals and digital technology, Viera Biolková, Milan Sigmund, Tomáš Frýza)

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

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

Laboratory in Optoelectronics and Photonics (research and instruction in optoelectronics, photonics and optical communications, Otakar Wilfert, Lucie Hudcová)

Laboratory of TV and Video Technology (research and instruction in digital TV and video technology, Martin Slanina, Ladislav Polák)

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

Laboratory of Mobile Communication (research and instruction in mobile wireless communication, Stanislav Hanus, Martin Slanina, Jiří Miloš)

Laboratory of Antennas and Electromagnetic Field (research and instruction in EM fields, antennas and design of radio links, Jaroslav Láčík, Tomáš Mikulášek)

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

Laboratory for Student Research (student projects, theses, self-study, Jiří Šebesta)

Electronic Technology Laboratory (dry and wet techniques for printed circuit boards, photographic production of patterns, Aleš Vančura, Jaroslav Voráč)

Computer Laboratories (two laboratories for computer-aided exercises in circuits, signals and systems, special areas of radioelectronics and communication technology, Josef Báňa)

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

Research Laboratory of Numerical Methods (applied electromagnetism and electromagnetic field modelling, Zbyněk Raida, Petr Kadlec)

Research Laboratory of Optical Communications (research in measurement, testing and design of light-transmitting and atmospheric optical connectors, Otakar Wilfert, Lucie Hudcová)

Research Laboratory of Signal Processing (digital radio communication and methods for digital signal processing, Roman Maršálek)
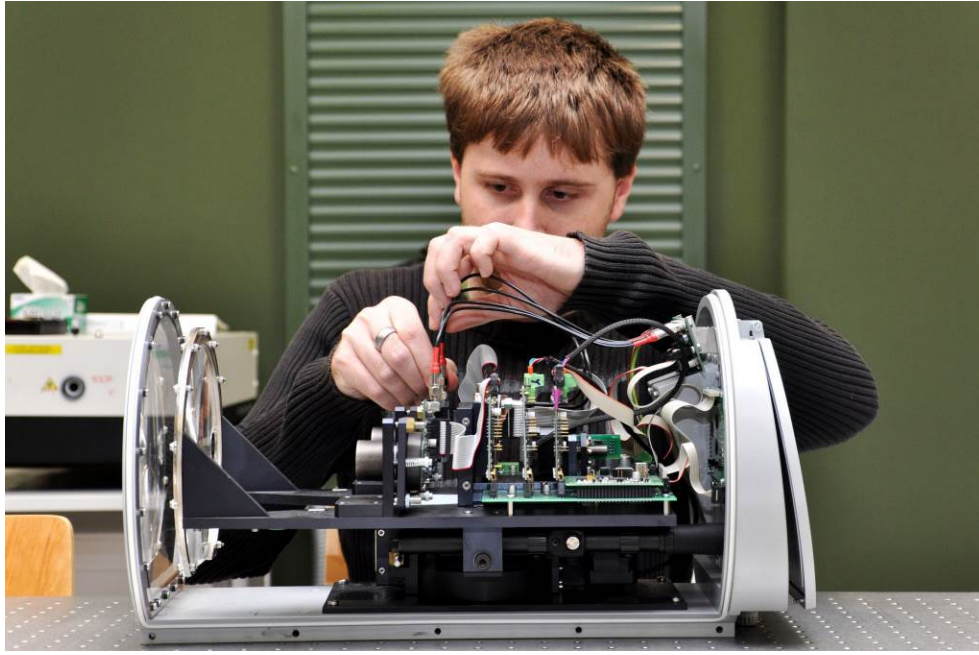
A device for optical data transfer designed at the department

Department of Telecommunications

Prof. Ing. Jiří Mišurec, CSc.

Head

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Professors

Prof. Ing. Miloslav Filka, CSc.
Prof. Ing. Jiří Mišurec, CSc.,
Prof. Ing. Zdeněk Smékal, CSc.
Prof. Ing. Kamil Vrba, CSc.

Associate Professors

doc. Ing. Karel Burda, CSc.
doc. Ing. Radim Burget, Ph.D.
doc. Ing. Jan Hajný, Ph.D.
doc. Ing. Norbert Herencsar, Ph.D.
doc. Ing. Jiří Hošek, Ph.D.
doc. Ing. Jan Jeřábek, Ph.D.
doc. Ing. Dan Komosný, Ph.D.
doc. Ing. Jaroslav Koton, Ph.D.
doc. Ing. Ivo Lattenberg, Ph.D.
doc. Ing. Petr Mlýnek, Ph.D.
doc. Ing. Vít Novotný, Ph.D.
doc. Mgr. Pavel Rajmic, Ph.D.
doc. Ing. Kamil Říha, Ph.D.
doc. Ing. Jiří Schimmel, Ph.D.
doc. Ing. Vladislav Škorpil, CSc.
doc. Ing. Václav Zeman, Ph.D.

Lecturers

Ing. Miroslav Balík., Ph.D., Ing. Petr Číka, Ph.D., Ing. Radim Číž, Ph.D., Mgr. Radka Koton, Ing. Pavel Hanák, Ph.D., Ing. Ondřej Krajsa, Ph.D., Ing. David Kubánek, Ph.D., Ing. Anna Kubánková, Ph.D., Ing. Lukáš Langhammer, Ph.D., Ing. Lukáš Malina, Ph.D., Ing. Zdeněk Martinásek, Ph.D., Ing. Jiří Mekyska, Ph.D., Ing. Jiří Přinosil, Ph.D., Ing. Petr Sysel, Ph.D., Ing. Pavel Šilhavý, Ph.D., Ing. Milan Šimek, Ph.D.

Research and Administrative Staff

RNDr. Petr Bílek, Ing. Vlastimil Člupek, Ing. Jakub Frolka, Ing. Tomáš Horváth, Ing. Dominik Kováč, Ing. David Kurc, Magda Lounková, Jitka Hošková, Ing. Lukáš Malina, Ph.D., Ing. Jan Mašek, Ing. Pavel Mašek, Ing. Jiří Mekyska, Ph.D., Ing. Jiří Minář, Ing. Ľubomír Mráz, Ing. Petr Münster, Ph.D., Jana Nosková, Ing. Bohumil Novotný, Lukáš Pazdera, Robert Pernica, Jitka Šichová, Ing. Václav Uher, Ph.D., Ing. Vlastimil Člupek, Ph.D., Ing. Martin Koutný, Ph.D

Doctoral Students

Ing. Petr Blažek, Ing. Rastislav Červeňák, Ing. Milan Čučka, Ing. Marie Daňková, Ing. Petr Dzurenda, Ing. Jakub Frolka, Ing. Petr Frenštátský, Ing. Radek Fujdiak, Ing. Zoltán Galáž, Ing. Pavol Harár, Ing. Tomáš Horváth, Ing. Juraj Jakubík, Ing. Tomáš Kiska, Ing. Lukáš Kočí, Ing. Dávid Kondicz, Ing. Martin Kenyeres, Ing. Dominik Kováč,Ing. Petr Ležák, Ing. Zdeněk Mžourek, Ing. Pavel Mašek, Ing. Jan Mašek, Ing. Jiří Minář, Ing. Michaela Novosadová, Ing. Bohumil Novotný, Ing. Adam Olejár, Ing. Václav Oujezský, Ing. Ondřej Pavelka, ing. Tomáš Pavlíček, Ing. Lukáš Povoda, Ing. Josef Polák, Ing. David Smékal, Ing. David Troják, Ing. František Urban, Ing. Lukáš Vlček, Ing. Kryštof Zeman, Ing. Vojtěch Burian, Ing. Jan Dvořák, Ing. David Grenar, Ing. Pavol Iľko, Ing. Petr Kříž, Ing. Ján Mucha, Ing. Jiří Pokorný, Ing. Zuzana Polešáková, Ing. Martin Rajnoha, Ing. Ján Sláčik, Ing. Ondřej Sládok, Ing. Vojtěch Zvončák, Ing. Martin Štůsek

Main Interests

The department has been developing the Bachelor study area Teleinformatics and the Master study area Tele-communication and Information Technology. Instruction seeks balance between all areas of communications, includes computer systems and network, design of network applications in different programming languages. Students are instructed in design of analog and digital circuits, microprocessors and signal processors and their applications. They can specialise in multimedia informatics, i.e.digital processing of speech, music or images. A follow-up Ph.D. study area Teleinformatics is offered.

Another Bachelor programme is Audio Engineering where instruction is provided jointly with Janáček Academy of Music and Performing Arts in Brno. It is an interdisciplinary programme preparing specialists in sound technology, sound signal processing and studio recording, with insight into music and arts. Master degree programme was accredited in 2015.

Instruction started in the new programme Information Safety (IBEP). It is centred on safety of information and communication technologies (ICT), security of networks and Internet. The students will learn how toconfigurate and manage extensive computer infrastructures and use ethical hacking to test computer network resistance. The programme includes attractive subjects in cryptography of programming or network operational systems, economics and software legislative. It is an interdisciplinary programme provided jointly with Faculty of Law, Masaryk University in Brno and Faculty of Management, Brno University of Technology. The graduates will be able to find jobs not only in purely technical positions, but also commercial, consultancy or management positions.

The department has its own LTE technology

The department secured funding from various educational and research programmes. In 2016 our research and development teams were involved in projects relating to basic and applied research yielding nearly 40 million CZK. A research team has been very successful in providing up-to-date multimedia services via mobile and wireless networks. Several members of the team are involved in industrial research in the programme of Ministry of Industry and Trade and Technology Agency of the Czech Republic, Ministry of the Interior and Czech Science Foundation. Close cooperation continued with companies GiTy a.s., Webnode s.r.o., Saturn Holešov, TTCtele-komunikace, MegA, a.s. - Měřicí Energetické aparáty. The department also participated in projects jointly con-

ducted with commercial companies T-Mobile, Honeywell, and Telekom Austria,E.ON Česká republika and was involved in activities of the 'Centre of Sensor, Information and Communication Systems - SIX'.

Major Achievements

The main research interests of the department are converged information and communication systems focused on multimedia informatics, electronic systems for medical technology. In 2016 the department achieved very good results:

Solution of cryptographic protection of communication and information systems of data networks, security of electronic archives.

Design and implementation of algorithms for digital processing of speech and music signals for telecommunication and multimedia applications, embedded systems for acoustic signal processing, and software for these systems.

Development of electronic devices for medical data transmission and processing, design and implementation of algorithms for processing and analysis of biomedical signals (NMR and CT tomography and ultrasound) and 3D modelling of parts of human body for diagnostics and surgery.

Research and development of telemetric systems, remote data collection systems, systems for wireless sensor networks,networks for industrial data collection and control(smart grids of power plants, waterworks, transportation, etc.).

Design and optimisation of algorithms for digital signal processing (digital filters, signal detection, spectral analysis, etc.),implementation of algorithms in signal processors and microcontrollers.

Research and design of systems of speech and image processing, security of multimedia systems archives, evaluation of emotions in speech and mimics using genetic programming.

Research and development of an intelligent system for power grid control and identification of threats in power grid infrastructure.

Major Research Projects

Research of Cryptographic Primitives for Secure Authentication and Protection of Digital Identity – GAČR GP14-25298P

Investigator:Jan Hajný

Research and Development of a Technology for Detection of Emotions in Unstructured Data – MPO FR-TI4/151

Investigator: Zdeněk Smékal

Localisation and Classification of Vibrations Using an Optical Fiber Sensor over Large Distances – MPO FR-TI4/696

Investigator: Vít Novotný

TeleCalmPlus: The Smoke in the Chimney – An Intelligent Sensor-Based Telecare Solution for Homes – IVF-NSC Project No. 21280013

Investigator: Milan Šimek

System Synthesis and Analysis – GA16-06175S

Investigator: Jaroslav Koton

Active Elements withDifferential Gates for Design of Original Non-Differential and Pseudo-Differential Function Blocks– GJ16-11460Y

Investigator: Norbert Herencsár

Perfusion MRI Imagingby Compressed Sensing – GA16-13830S

Investigator: Pavel Rajmic

Selected Publications

ELFMARKOVA, N.; GAJDOŠ, M.; MRAČKOVÁ, M.; MEKYSKA, J.; MIKL, M.; REKTOROVÁ, I. Impact of Parkinson' s disease and levodopa on resting state functional connectivity related to speech prosody control. *PARKINSONISM & RELATED DISORDERS,* 2016, vol. 22, no. 1, p. S52 (S55 p.) ISSN: 1353-8020.

BURDA, K. Kryptografické systémy. *Sdělovací technika,* 2016, roč. 64, č. 1, s. 30-32. ISSN: 0036-9942.

MOTÚZ, R.; MÜNSTER, P.; FILKA, M. PMD Study & Measurement – Fixed Analyzer Method. *Journal of Communications Software and Systems,* 2016, vol. 11, no. 4, p. 199-203. ISSN: 1845-6421.

JEŘÁBEK, J.; ŠOTNER, R.; HERENCSÁR, N.; VRBA, K.; DOSTÁL, T. Behavioral model for emulation of ZC-CG-VDCC. *IEICE Electronics Express,* 2016, vol. 13, no. 18, p. 1-6. ISSN: 1349-2543.

GALÁŽ, Z. Analýza ručně psaného projevu: perspektivní metoda diagnostiky Parkinsonovy nemoci. *Sdělovací technika,* 2016, č. 2, s. 24-34. ISSN: 0036-9942.

DROTÁR, P.; MEKYSKA, J.; REKTOROVÁ, I.; MASÁROVÁ, L.; SMÉKAL, Z.; FAÚNDEZ ZANUY, M. Evaluation of handwriting kinematics and pressure for differential diagnosis of Parkinson' s disease. *ARTIFICIAL INTELLIGENCE IN MEDICINE,* 2016, vol. 67, no. 1, p. 39-46. ISSN: 0933-3657.

BURDA, K. Bezpečnost kryptosystémů. *Sdělovací technika,* 2016, roč. 64, č. 2, s. 39-41. ISSN: 0036-9942.

MALINA, L.; SMRŽ, J.; HAJNÝ, J. Electronic Elections Based on Group Signatures. *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems,* 2016, vol. 5, no. 1, p. 15-21. ISSN: 1805-5443.

KHATEB, F.; KUBÁNEK, D.; TSIRIMOKOU, G.; PSYCHALINOS, C. Fractional-order filters based on low- voltage DDCCs. *Microelectronics Journal,* 2016, vol. 2016 (50), no., IF: 0. 836, p. 50-59. ISSN: 0026-2692.

ZEMAN, K.; MAŠEK, P.; HOŠEK, J. Experimentální ověření vhodnosti nízkoodběrových IoT zařízení pro implementaci kryptografických primitiv. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2016, roč. 18, č. 1, s. 8-14. ISSN: 1213-1539.

VOZŇÁK, M.; ZBRANEK, I.; MEHIC, M.; KOMOSNÝ, D.; TORAL-CRUZ, H.; CHUN-WEI LIN, J. Covert Channel in RTP Payload Using a Pointer In SIP Header. *Communications,* 2016, vol. 18, no. 1, p. 40-47. ISSN: 1335-4205.

ŠLACHTA, J.; VOZŇÁK, M.; KOMOSNÝ, D.; TORAL-CRUZ, H.; FAZIO, P. Automatically Provisioned Embedded Communication System Based on OpenWrt Platform. *Communications,* 2016, vol. 18, no. 1, p. 48-55. ISSN: 1335-4205.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; PROKOP, R.; LAHIRI, A.; DOSTÁL, T.; VRBA, K. First-order transfer sections with reconnection-less electronically reconfigurable high-pass, all- pass and direct transfer character. *Journal of Electrical Engineering,* 2016, vol. 67, no. 1, p. 12-20. ISSN: 1335-3632.

BURDA, K. Teorie utajení zpráv. *Sdělovací technika,* 2016, roč. 64, č. 3, s. 46-48. ISSN: 0036-9942.

KOMOSNÝ, D.; VOZŇÁK, M.; BEZZATEEV, S.; KATHIRAVELU, G. The Use of European Internet Communication Properties for IP Geolocation. *Information Technology and Control,* 2016, vol. 45, no. 1, p. 77-85. ISSN: 1392-124X.

MALINA, L.; HAJNÝ, J.; FUJDIAK, R.; HOŠEK, J. On Perspective of Security and Privacy- Preserving Solutions in the Internet of Things. *Computer Networks,* 2016, vol. 102, no. 2016, p. 83-95. ISSN: 1389-1286.

KUBÁNEK, D.; KHATEB, F.; TSIRIMOKOU, G.; PSYCHALINOS, C. Practical Design and Evaluation of Fractional- Order Oscillator Using Differential Voltage Current Conveyors. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2016, vol. 2016 (35), no. 6, IF: 1. 178, p. 2003-2016. ISSN: 0278-081X.

KENYERES, M.; KENYERES, J.; ŠKORPIL, V. The Distributed Convergence Classifier Using the Finite Difference. *Radioengineering,* 2016, vol. 25, no. 1, p. 148-155. ISSN: 1210-2512.

GALÁŽ, Z.; MEKYSKA, J.; MŽOUREK, Z.; SMÉKAL, Z.; REKTOROVÁ, I.; ELIÁŠOVÁ, I.; KOŠŤÁLOVÁ, M.; MRAČKOVÁ, M.; BERANKOVA, D. Prosodic Analysis of Neutral, Stress-modified and Rhymed Speech in Patients with Parkinson' s Disease. *COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE,* 2016, vol. 127, no. 1, p. 301-317. ISSN: 0169-2607.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; HORNG, J.; VRBA, K.; DOSTÁL, T. Simple Oscillator with Enlarged Tunability Range Based on ECCII and VGA Utilizing Commercially Available Analog Multiplier. *Measurement Science Review,* 2016, vol. 16, no. 2, p. 35-41. ISSN: 1335-8871.

BURDA, K. Teorie autentizace zpráv. *Sdělovací technika,* 2016, roč. 64, č. 4, s. 36-38. ISSN: 0036-9942.

ANDREEV, S.; HOŠEK, J.; OLSSON, T.; JOHNSSON, K.; PYATTAEV, A.; OMETOV, A.; OLSHANNIKOVA, E.; GERASIMENKO, M.; MAŠEK, P.; KOUCHERYAVY, Y.; MIKKONEN, T. A Unifying Perspective on Proximity-based Cellular- Assisted Mobile Social Networking. *IEEE COMMUNICATIONS MAGAZINE,* 2016, vol. 54, no. 4, p. 108-116. ISSN: 0163-6804.

MAŠEK, P.; HOŠEK, J.; ZEMAN, K.; ŠTŮSEK, M.; KOVÁČ, D.; ČÍKA, P.; MAŠEK, J.; ANDREEV, S.; KRÖPFL, F. Implementation of True IoT Vision: Survey on Enabling Protocols and Hands- on Experience. *International Journal of Distributed Sensor Networks,* 2016, vol. 2016, no. 4, p. 1-18. ISSN: 1550-1329.

MALINA, L.; HORVÁTH, T.; MÜNSTER, P.; HAJNÝ, J. Security Solution with Signal Propagation Measurement for Gigabit Passive Optical Networks. *OPTIK,* 2016, vol. 127, no. 16, p. 6715-6725. ISSN: 0030-4026.

KENYERES, M.; KENYERES, J.; ŠKORPIL, V. The analysis of the push- sum protocol in various distributed systems. *European Scientific Journal,* 2016, vol. 12, no. 12, p. 64-80. ISSN: 1857-7881.

BARTL, M. Data processing and object recognition in radar reflectivity images. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2016, vol. 18, no. 2, p. - (- p.) ISSN: 1213-1539.

DZURENDA, P.; HAJNÝ, J. Výkonnostní analýza současných softwarových knihoven pro výpočty modulární aritmetiky. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2016, roč. 18, č. 2, s. 33-38. ISSN: 1213-1539.

FUJDIAK, R.; MIŠUREC, J.; MLÝNEK, P.; LEONARD, J. Cryptograph key distribution with elliptic curve Diffie-Hellman algorithm in low- power devices for power grids. *Revue Roumaine des Sciences Techniques - Serie Électrotechnique et Énergétique,* 2016, vol. 61, no. 1, p. 84-88. ISSN: 0035-4066.

BURDA, K. Hešovací funkce. *Sdělovací technika,* 2016, roč. 64, č. 5, s. 27-29. ISSN: 0036-9942.

YU, X.; YUAN, X.; DONG, E.; ŘÍHA, K. Target extraction of banded blurred infrared images by immune dynamical algorithm with two- dimensional minimum distance immune field. *INFRARED PHYSICS & TECHNOLOGY,* 2016, vol. 77, no. 2016, p. 94-99. ISSN: 1350-4495.

HORVÁTH, T.; FUJDIAK, R.; ČUČKA, M.; MIŠUREC, J.; DAŇKOVÁ, M. Comparison of Bit Error Rate of Line Codes in NG- PON2. *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems,* 2016, vol. 5, no. 2, p. 95-100. ISSN: 1805-5443.

KENYERES, M.; KENYERES, J. Impact of an attack on a network executing distributed computing. *UPB Scientific Bulletin, Series C: Electrical Engineering,* 2016, vol. 78, no. 2, p. 35-52. ISSN: 1454-234X.

MARTINÁSEK, Z.; ZEMAN, V.; MALINA, L.; MARTINÁSEK, J. k- Nearest Neighbors Algorithm in Profiling Power Analysis Attacks. *Radioengineering,* 2016, vol. 1, no. 1, p. 11-28. ISSN: 1210-2512.

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Aplikovaná kryptografie
(doc. Ing. Karel Burda, CSc.)

Moderní síťové technologie
(doc. Ing. Vít Novotný, Ph.D.)

Laboratories

Laboratory of Circuit Technology (research of analog current-mode circuits, Kamil Vrba)

Laboratory of Converged Networks (research and instruction in modern data communication networks and services, 2G - 4G mobile telecommunication networks and systems for data network provision of voice and multimedia services, Vít Novotný, Pavel Šilhavý)

Laboratory of Digital Music Studio (instruction and research in real-time multichannel audio signal processing on PCs and embedded systems, Jiří Schimmel)

Laboratory of Electroacoustics and Studio Technology (anechoic chamber, instruction and research in measurement of electroacoustic converters, identification and analysis of sound sources, space acoustics, analysis and synthesis of sound fields, Jiří Schimmel)

Acoustic Laboratory (research in sound effects, multichannel sound systems, 3D audio, conference audio systems, Jiří Schimmel)

Laboratory of Grid Technology (instruction in network technologies, research of switch and indicator management, analysis of stationary and wireless local computer networks operation, modelling of algorithms used in modern data networks, Jaroslav Koton)

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

Laboratory of Data Transmission (instruction in data communication and research in data transmission, modulation methods and error-protection codes, esp. for xDSL and PLC systems, modelling of access network and end device characteristics, Pavel Šilhavý)

Laboratory of Design Systems (instruction of programming languages, modelling of communication systems, telecommunication networks and electronic circuits, research on modern communication technologies, design of electronic devices, Radim Číž)

Laboratory of Sensor Systems and Signals (instruction and research in sensor networks based on the IEEE 802.15.4 standard, analysis of Zigbee and 6lowPAN protocols, sensor units configuration, data transmission and wireless network management, microcontrollers Atmel AVR, Ondřej Krajsa)

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

Laboratory of Analog Circuits and Analog-Digital Conversion (instruction and research of analogue circuits and mutual analogue-digital converters, David Kubánek)

Laboratory of Communication Systems (instruction and research in access and transportation networks, transportation and connection systems, converged telecommunication and computer networks, high-speed systems and telecommunication network services, Vladislav Škorpil)

Laboratory of Transmission Networks (research in FPGA and high-rate multimedia data transmission up to 100 Gb/s, Vladislav Škorpil)

Laboratory of Acoustic Signal Processing (design, optimisation and implementation of algorithms for speech and acoustic signal processing, optimisation of algorithms for multi-core computing systems, instruction in Digital Acoustic Signal Processing, computers and their peripherals, Miroslav Balík)

Laboratory of Multimedia Signals (research and development of multimedia embedded devices with ARM, Harvard architecture and VLIW architecture digital signal processors, optimization of algorithms for real-time digital signal processing, instruction in Signal Processors, Digital Filters and Digital Signal Processing, Petr Sysel)

Research and Instruction Laboratory of Safety Systems (research and development of cryptographic methods for communication and information systems, research and development of electronic protection systems, Karel Burda)

Telepresence Studio (research and development in videoconferencing and telepresenting services, Petr Číka)
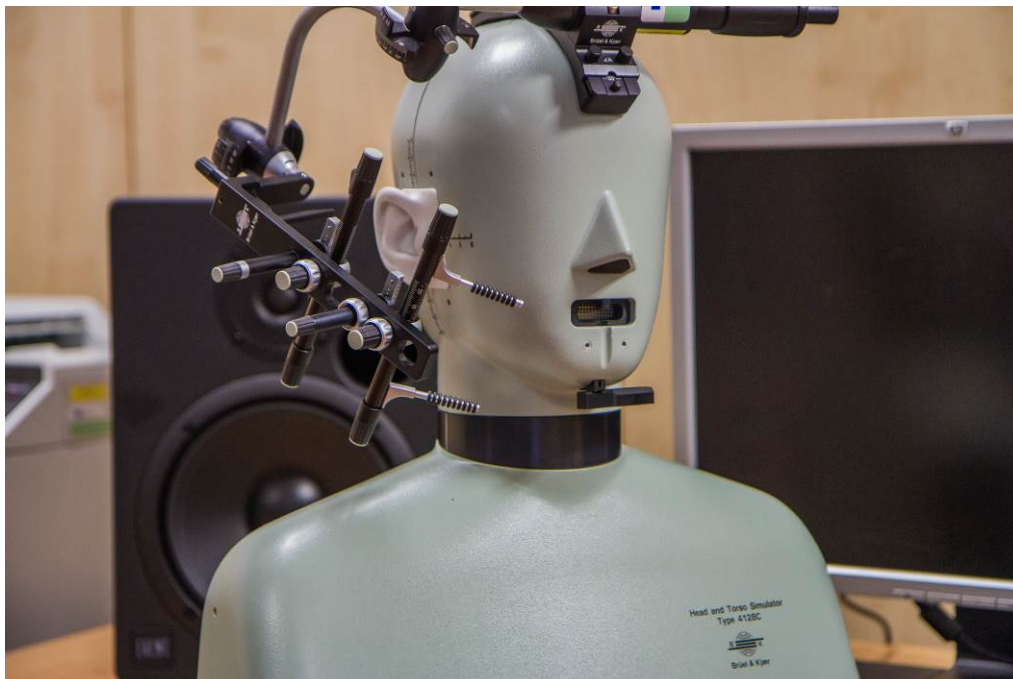
Head and torso simulator with artificial ear and mouth for measurement of electroacoustic characteristics of telecommunication devices such as communicators, microphones and mobile phones

Department of Theoretical and Experimental Electrical Engineering

Prof. Ing. Pavel Fiala, Ph.D.
Head

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Professor Emeritus

Prof. Ing. Libor Dědek, CSc.

Professors

Prof. Ing. Karel Bartušek, DrSc.
Prof. Ing. Jarmila Dědková, CSc.
Prof. Ing. Pavel Fiala, Ph.D.
Prof. Ing. Eva Gescheidtová, CSc.

Associate Professors

doc. Ing. Petr Drexler, Ph.D.
doc. Ing. Jan Mikulka, Ph.D.
doc. Ing. Jiří Sedláček, CSc.
doc. Ing. Miloslav Steinbauer, Ph.D.

Lecturers

Ing. Tibor Bachorec, Ph.D., Mgr. Přemysl Dohnal, Ing. Martin Friedl, Ph.D., Ing. Radim Kadlec, Ph.D., Ing. Radim Kořínek, Ph.D., Ing. Tomáš Kříž, Ph.D., Ing. Petr Marcoň, Ph.D., Ing. Dušan Nešpor, Ph.D., Ing. Zdeněk Roubal, Ph.D., Ing. Zoltán Szabó, Ph.D., Ing. Robert Urban, Ph.D.

Doctoral Students

Ing. Martin Čáp, Ing. Jan Dušek, Ing. Michal Hanzelka, MBA, Ing. David Hladký, Ing. Jiří Chytil, Ing. Ksenia Kořínková, Ph.D., Ing. Pavel Křepelka, Ing. Roman Matloch, Ing. Jaroslav Michalec, Ing. Rastislav Motúz, Ing. Jiří Sliž, Ing. Eliška Vlachová Hutová

Administrative and Technical Staff

Eva Cupáková, Alena Javůrková, Otáhalová Veronika

Main Interests

The department provides instruction in all undergraduate and postgraduate programmes targeted at education in the key areas of electrical engineering through understanding of the basic principles of electrical engineering, safety issues, measurement of electrical and non-electrical characteristics with focus on special applications and modelling of electromagnetic fields. Bachelor, Master and PhD theses deal with topics of current and long-term research interests of the department. Instruction is provided in up-to-date laboratories, computer laboratories and a research laboratory for students' work on their diploma theses.

Research is conducted in laboratories with top equipment for numerical modelling, magnetic measurements, light technology, low-level measurements,a pulse-sources laboratory, laboratory of microwave technology and research laboratory of electro optics and laser technology and laboratory of modelling and optimisation in electromechanical systems of FEEC.The department focused on basic research in the field of numerical modelling, subatomic structures, wide-band signals, noise spectroscopy and specific designs of metamaterial and resonance structures for nuclear magnetic resonance and electron microscopy (GAČR),long-term research on analysis of numerical models of nanostructures and follow-up technologies with design tests in the centre CEITEC, supported by GAČR. In cooperation IMI International, s. r. o. - Norgren CZ research on nanostructures on the basis of graphene is being conducted for applications in nanosensors (GAČR). Another research issue is processingof images of magnetic resonance and electric impedance tomography. Research is also centred on the design of specific measuring methods, signal processing and evaluation, and is supported by grant projects and contract cooperation with the industrial sector. Long-term safety research on the impact of electromagnetic fields on inanimate materials and living substance, pulse processes and wide-band detection methods has been pursued. The Institute of Experimental Technology must be mentioned. It was founded in 2008 and draws on UTEE's experience with involvement of students in research work and close contacts with the industrial sector. The Institute adopted an innovative approach to eduction where the key issue is involvement of student teams in real industrial

projects. The teams are composed of secondary and tertiary school students and research workers. The department organizes professional competitions, e.g. „Mikrokontroléry letí".

Device MOSAD developed in cooperation with the company TES

Major Achievements

Basic research was focused on the design of progressive numerical methods for modelling of nanostructures and periodical structures, wideband signal processing, noise spectroscopy, specific applications of metamaterial structures for NMR and electron microscopy. Applied research was focused on evaluation of NMR images and tests of novel imaging methods, upgrading and testing of the NQR system. Ph.D. students were engaged in measurements on a homogeneous group of students. Influence of changes in geomagnetic field on ithe characteristics of an individual with predictable impact in the society (CAČR).

In 2016 the department was awarded apatent – 'The Method of Evaluation of the Distribution, Density and Orientation of Ferromagnetic Electrically Conductive Fibres in Composite Materials and Detection Devices', Contract research continues with TES, s.r.o. on detection and localisation of partial charges in electrical power converters with liquid dielectric and data processing for identification of failures in rotating machines, mainly engines for power pumps..

Applied research was jointly conducted with TSE České Budějovice on infrared radiation and measurement of thermal field homogeneity in the area of incidence. Department's staff was involved in the project DeNeCor, the European project (ENIAC) and designed, implemented and tested a pulse NMR system. An operating sample was completed as a supplement to the submitted patent for non-destructive evaluation of the distribution of composite material fibres. A TM antenna system was designed for measurement and evaluation of ULF measurements of small geomagnetic changes (GAČR). Generation and detection of solitary power (EMG) pulses were investigated, and a series of operating devices was implemented. Periodic systems and structures in infrared EMG waves to be utilised as an information element or harvester were studied. Research was also focused on low-frequency harvesting, and vibration of mini- and microgenerators.

Experimental laboratory measurements for evaluation of the impact of magnetic field type on anorganic, organic and living substances were completed and published (GAČR).

The concept and construction of a linear drive (LINPO) was studied in the frame of contract research for IMI International, s.r.o. – Norgren CZ. A model of an induction flowmeter UTEE was developed for Badger Meter. Research on numerical modelling of plasma parameters was supported by the design and testing of a device for power and harmonic signal generation in radio frequency spectrum for plasma chamber/jet from Ecne Trading, a. s.

Long-term cooperation with the company PROTOTYPA, a. s. in research of specific measuring methods of single processes continued, and preparation is under way oflocation of a passive optical radar at the Brno airport. Joint research with Technische Universität Wien was carried out in in field of microtechnology and design.

The department is involved in centres SIX a CVVOZE. On faculty level the department cooperated in two international interdisciplinary research projects on wireless technologies (INWITE) and Advanced Wireless Technologies for Clever Engineering (ADWICE).

UTEE participated in upgrading of the first university interactive playroom in the Czech Republic'Elektrikárium' where the public is entertained and acquainted with issues of electricity, electrical engineering and associated fields. The department organised, in cooperation with Lublin University of Technology, Poland, an internatinal workshop for Ph.D. students IIPhDW 2016

Major Research Projects

Devices for Neurocontrol and Neurorehabilitation DeNeCoR – 7H13014

Co-investigators: Pavel Fiala and Martin Čáp

Long-Distance Identification of Small Reflectors by Electromagnetic Waves – GAČR 15-08803S

Investigator: Petr Drexler

Research of Artificial Electromagnetic Materials and Metamaterials Using Utility Numerical and Imaging-Methods – GAČR 13-09086S

Investigator: Pavel Fiala

Selected Publications

NASSWETTROVÁ, A.; ŠMÍRA, P.; KŘIVÁNKOVÁ, S. Effect of microwave heating on compressive strength of beech wood (Fagus sylvatica L.) parallel to grain. *Drying Technology,* 2016, vol. 9, no. 34, p. 1011-1022. ISSN: 1532-2300.

SLIŽ, J. Metody segmentace a rozpoznání číslic analogového elektroměru. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2016, roč. 18, č. 1, s. 21-27. ISSN: 1213-1539.

MIKULKA, J.; VLACHOVÁ HUTOVÁ, E.; KOŘÍNEK, R.; MARCOŇ, P.; DOKOUPIL, Z.; GESCHEIDTOVÁ, E.; HAVEL, L.; BARTUŠEK, K. MRI- Based Visualization of the Relaxation Times of Early Somatic Embryos. *Measurement Science Review,* 2016, vol. 16, no. 2, p. 54-61. ISSN: 1335-8871.

SZABÓ, Z.; FIALA, P.; LACINA, K.; ŽÁK, J.; VÁCLAVEK, T.; SOPOUŠEK, J.; ŽERAVÍK, J.; SKLÁDAL, P. Transistor Amplifier as an Electrochemical Transducer with Intuitive Optical Read-out: Improving Its Performance with Simple Electronic Solutions. *Electrochimica Acta,* 2016, no. 216, p. 147-151. ISSN: 0013-4686.

NASSWETTROVÁ, A.; KŘIVÁNKOVÁ, S.; ŠMÍRA, P.; ŠTĚPÁNEK, J.; FRIEDL, M.; TRUBÁK, J. Acoustic detection of wood- destroing insects during. *WOOD RESEARCH,* 2016, vol. 61, no. 5, p. 755-766. ISSN: 1336-4561.

FIALA, P.; DREXLER, P.; NEŠPOR, D.; SZABÓ, Z.; MIKULKA, J.; POLÍVKA, J. The Evaluation of Noise Spectroscopy Tests. *ENTROPY,* 2016, vol. 18, no. 12, p. 1-16. ISSN: 1099-4300.

Bachelor's Courses

Bezpečná elektrotechnika
(Ing. Radim Kadlec, Ph.D.)

Elektrotechnický seminář
(doc. Ing. Miloslav Steinbauer, Ph.D.)

Elektrotechnika
(Ing. Marcoň Petr, Ph.D.)

Elektrotechnika 1
(doc. Ing. Jiří Sedláček, CSc., prof. Ing. Jarmila Dědková, CSc.)

Elektrotechnika 2
(doc. Ing. Jiří Sedláček, CSc., doc. Ing. Miloslav Steinbauer, Ph.D.)

Elektrotechnika pro audio inženýrství
(doc. Ing. Petr Drexler, Ph.D.)

Měření v elektrotechnice
(prof. Ing. Karel Bartušek, DrSc., doc. Ing. Jan Mikulka, Ph.D., prof. Ing. Eva Gescheidtová, CSc.)

Měření v elektrotechnice pro audio inženýrství
(prof. Ing. Karel Bartušek, DrSc.)

Seminář C++
(prof. Ing. Pavel Fiala, Ph.D.)

Počítačové modelování elektrotechnických zařízení a komponentů
(prof. Ing. Pavel Fiala, Ph.D.)

Vybrané partie základů elektrotechniky v angličtině
(Ing. Petr Marcoň, Ph.D.)

Master's Courses

Bezpečná elektrotechnika
(Ing. Radim Kadlec, Ph.D.)

Bezpečnost zařízení
(doc. Ing. Miloslav Steinbauer, Ph.D.)

Elektrické instalace
(Ing. Radim Kadlec, Ph.D.)

Modelování elektromagnetických polí
(Ing. Tibor Bachorec, Ph.D.)

Ph.D.Courses

Numerické úlohy s parciálními diferenciálními rovnicemi(prof. Ing. Pavel Fiala, Ph.D.)

Speciální měřicí metody (prof. Ing. Karel Bartušek, DrSc.)

Laboratories

Laboratory of Electrical Measurements (instruction in Measurements in Electrical Engineering and Measurements in Electrical Engineering for Audio Engineering, Zoltán Szabó)

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

Laboratory of Electrical Engineering and Electrical Installations (instruction laboratory for Electrical Installations, Electrotechnical Seminar and Electrical Engineering, Radim Kadlec)

IET Laboratory (instruction laboratory, Miloslav Steinbauer)

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

Computer Laboratory (instruction in Electrotechnical Seminar, Modelling of Electromagnetic Fields, Computer Modelling of Electrical Devicesand Components and Seminar C++, Miloslav Steinbauer)

Seminar Laboratory (Miloslav Steinbauer)

Research Laboratory of Magnetic Measurement (research laboratory of magnetic measurement, Zdeněk Roubal)

Research Laboratory of Light Technology (measurement of the parameters of light sources, Zdeněk Roubal)

Restricted AccessLaboratory (basic and applied research of numerical methods, Pavel Fiala)

Research Laboratory for Student Theses (research laboratory for students, Martin Friedl)

Research Laboratory of Printed Circuit Boards (development of printed circuit boards, Zoltán Szabó)

Research Laboratory for Prototype Development (research laboratory for doctoral students, Martin Friedl)

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

Research Laboratory of Electro-Optics and Laser Technology (optoelectronic measuring methods, Petr Drexler)

Prof. Armin Delong lecturing at the department

Department of Power Electrical and Electronic Engineering

doc. Ing. Ondřej Vítek, Ph.D.
Head

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Professors

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

Associate Professors

doc. Ing. Bohuslav Bušov, CSc.
doc. Ing. Bohumil Klíma, Ph.D.
doc. Ing. Čestmír Ondrůšek, CSc.
doc. Dr. Ing. Miroslav Patočka,
doc. Ing. František Veselka, CSc.
doc. Ing. Ondřej Vítek, Ph.D.
doc. Ing. Pavel Vorel, Ph.D.

Lecturers

Ing. Radoslav Cipín, Ph.D., Ing. Dalibor Červinka, Ph.D., Ing. Petr Dohnal, Ph.D., Ing. Petr Huták, Ph.D., Ing. Rostislav Huzlík, Ph.D., Ing. Marcel Janda, Ph.D., Mgr. Petr Kloc, Ph.D., Ing. Martin Mach, Ing. Ivo Pazdera, Ph.D. Ing. Petr Procházka, Ph.D., Ing. Jiří Valenta, Ph.D.

Doctoral Students

Ing. Jan Bárta, Ing. Jan Bulín, Ing. Jiří Ctibor, Ing. Lukáš Dostál, Ing. Jaroslav Chlup, Ing. Petr Chrobák, Ielyzaveta Ishkova, Ing. Roman Juchelka, Ing. Ladislav Karásek, Ing. Jiří Klíma, Ing. Jan Knobloch, Ing. Martin Kroupa, Ing. Marek Kurzepa, Ing. Martin Mach, Ing. Jan Martiš, Ing. Jan Mikláš, Ing. Aleš Mikulčík, Ing. Lukáš Mišinger, Ing. Veronika Novotná, Ing. Vladimír Ondřejček, Ing. Jan Pígl, Ing. Matrin Prudík, Ing. Ondřej Rubeš, Ing Josef Samek, Ing. David Šimek, Ing. Michal Šír, Ing. Petr Španěl, Ing. Jiří Štaffa, Ing. Marek Toman, Ing. Eva Vítková, BA., Ing. Michal Zelenka

Administrative and Technical Staff

Ing. Zdeněk Feiler, Ph.D., Zdeněk Liška, Josef Němec, Bc. Lucie Sobolová

Main Interests

The department provides instruction in the study area Power Electrical and Electronic Engineering in the Bachelor and Ph.D. programmes and in the study areas Power Electrical Engineering and Power Electronics in the Master degree programme. Instruction is focused on the theory and construction of electrical machines and devices, CAD systems including solutions for electromagnetic and thermal fields and optimisation methods for construction designs.The design, size, control and dynamics of electromechanical systems are the subject of instruction in electrical drives. Another area of interest is power electronics including DC/DC pulse converters (switching sources), DC/AC alternators, rectifiers etc. Attention is paid to the theory of regulation and digital control.

In basic research, the department deals with theoretical modelling of radiation energy transport in thermal plasma. Currently we are involved in basic research for medical purposes, in the development of special high voltage pulse sourcefor electroporation of cancer cells.

In applied research,electrical machines, power electronics, electrical drives and devices are in the focus of interest. Research is centered on low-voltage machines used in automotive industry, synchronous machines with permanent magnets, asynchronous and DC machines.The department´sstaffis experienced in the development of special machines such as startergenerators, controlled magnetic bearings and levitation systems. They focusedon power exploitation for electric arc extinction in low- and high-voltage devices, power converters of extreme parameters, optimal regulation of electrical drives aimed at loss minimisation in traction drives, implementation of ultracapacitors, accumulators and fuel cells in the system of traction drives.

The department cooperates with SPGU St Petersburg, TU Pskov, TU Omsk, TU Gliwice, TU Delft, TU Žilina, Masaryk University Brno, and industrial companies and institutions, e.g. JSC Electrocontact (Kineshma-RF), Siemens Elektromotory Drásov, OEZ Letohrad, APS Světlá nad Sázavou, ATAS Náchod, EMP Slavkov u Brna, JULI Motorenwerk Moravany, VUES Brno a.s., IVEP Brno, ŠLP Křtiny a.s., Tesla Blatná, Ingersoll Rand.
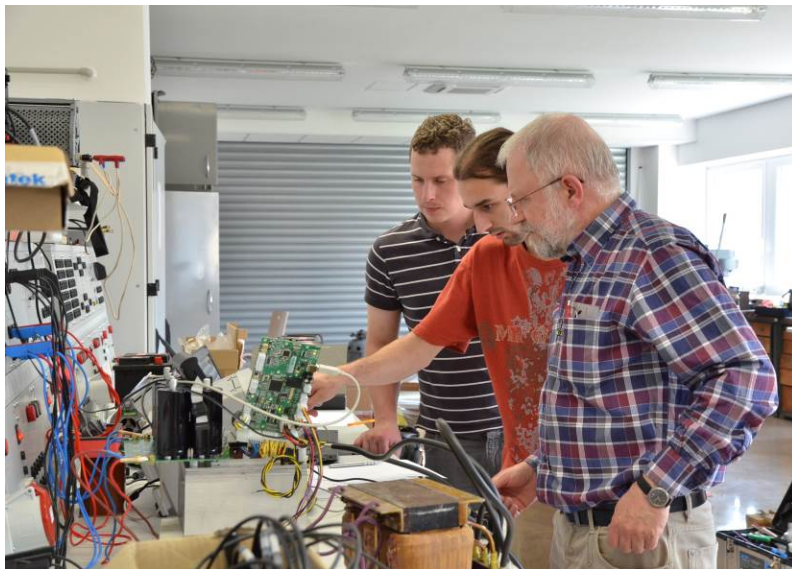
A research laboratory

Major Achievements

A notable achievement is the design of a specialdevice for electroporation of cancer cells, which was testedby a medical team from Faculty of Medicine, Masaryk University in Brnoand Veterinary and Pharmaceutical University Development of a novel concept of a device for ac electroporation of cells started.

We focused on implementation of an asynchronous motor 12 kW and 120000rev/min. The stator was implementedand various technologies for rotor production tested.An electromagnetic, thermal and mechanical design of an asynchronous machine 50 kW and 50000 rev/min. was completed.

A power converter for three-phase asynchronous motor up to 6 kW with 1st harmonic of supply voltage up to 2 Hz, All components for the power and control unit were designed and produced.

Within the framework of a TAČR project we cooperated with Tesla Blatná. As a result an operating sample of unconventional topology blocking converter was designed and implemented. The source with output 1.2 kW makes use of up-to-date semicondutor transistors SIC and operates on a switching frequency of 160 kHz. EMC tests were carried out followed by required modifications of converter connection.

A drive for radar systems control is being developed in cooperation with the company ERA. The drive consists of DC motors, power and control electronics and microcontroller. In 2016 its operation was tested on the testing dynamometer. And in 2017 first real application tests will be performed.

A unique DC/DC converter with high density of covered volume, approx. 1 kW / 180 cm^3·was designed for the company PBS.Despite a high level of integration it complies with standards.

A short circuit laboratory was set in operation as a result of contract research on international level (Eton - Austria, Techna International –Great Britain).

Members of the department were awarded a patent on the design of winding for three-phase ac rotating machines.

The department's staff started cooperation with Lappeenranta University of Technology (LUT) Finland. Placements are planned for next year.

Major Reserch Projects

Energy in Conditions of Sustainable Development (EN-PUR)–LO1210

Investigator: Vladimír Aubrecht.

Study of Thermodynamic and Electromagnetic Processes in Low-Voltage Switching Devices–GA15-14829S

Investigator: Vladimír Aubrecht.

Resolvers - Modern Position Sensors – FV10195

Investigator: Vítězslav Hájek,

Research Centre of Special Rotating Machines– TE02000232

Investigator: Čestmír Ondrůšek

Increasing Energy Efficiency of the Charging and Protection System Li-Ion–TA04020987

Investigator: Pavel Vorel

Selected Publications

KROUPA, M.; ONDRŮŠEK, Č.; HUZLÍK, R. Load Torque Analysis of Induction Machine. *MM Science Journal,* 2016, vol. 2016, no. March 2016, p. 887-891. ISSN: 1805-0476.

BÁRTA, J.; UZHEGOV, N.; ONDRŮŠEK, Č.; PYRHÖNEN, J. High-Speed Electrical Machine Topology Selection for the 6 kW, 120 000 rpm Helium Turbo- Circulator. *International Review of Electrical Engineering (IREE),* 2016, vol. Vol 11, no. No 1, p. 1-9. ISSN: 1827-6660.

ISHKOVA, I.; VÍTEK, O. Detection and classification of faults in induction motor by means of motor current signature analysis and stray flux monitoring. *Przeglad Elektrotechniczny,* 2016, vol. 92, no. 4/ 2016, p. 166-170. ISSN: 0033-2097.

BULÍN, T.; ONDRŮŠEK, Č.; HUZLÍK, R. Zařízení pro diagnostiku asynchronních motorů. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2016, roč. 18, č. 2, s. 51-62. ISSN: 1213-1539.

VESELKA, F. Modelování a simulace dynamické soustavy elektrického stroje. *Elektrotechnika v praxi,* 2016, roč. 2016, č. 5- 6, s. 50-58. ISSN: 0862-9730.

ZIMA, P.; FÜRST, T.; SEDLÁŘ, M.; KOMÁREK, M.; HUZLÍK, R. Determination of frequencies of oscillations of cloud cavitation on a 2-D hydro-foil from high- speed camera observations. *Journal of hydrodynamics,* 2016, vol. 28, no. 3, p. 369-378. ISSN: 1001-6058.

VESELKA, F. Magnetodynamická převodovka. *Elektrotechnika v praxi,* 2016, roč. 2016, č. 7- 8, s. 30-35. ISSN: 0862-9730.

SEDLÁŘ, M.; JI, B.; KRÁTKÝ, T.; REBOK, T.; HUZLÍK, R. Numerical and experimental investigation of three-dimensional cavitating flow around the straight NACA2412 hydrofoil. *OCEAN ENGINEERING,* 2016, vol. 2016, no. 123, p. 357-382. ISSN: 0029-8018.

KRČMA, F.; KLÍMOVÁ, E.; MAZÁNKOVÁ, V.; DOSTÁL, L.; OBRADOVIC. B.; NIKIFOROV, A.; VANRAES, P. Novel Plasma Source Based on Pin- Hole Discharge Configuration. *Plasma Medicine,* 2016, vol. 6, no. 1, p. 21-31. ISSN: 1947-5764.

BENOVA, E.; ATANASOVA, M.; BOGDANOV, T.; MARINOVA, P.; KRČMA, F.; MAZÁNKOVÁ, V.; DOSTÁL, L. Microwave plasma torch at water surface. *Plasma Medicine,* 2016, vol. 6, no. 1, p. 59-65. ISSN: 1947-5764.

BUŠOV, B.; KATOLICKÝ, Z.; BARTLOVÁ, M. TRIZ and turbojet engine innovation. *Procedia CIRP,* 2016, vol. 40, no. 1, p. 120-126. ISSN: 2212-8271.

BUŠOV, B.; BARTLOVÁ, M.; DOSTÁL, V. TRIZ and innovation of pressing. *Procedia CIRP,* 2016, vol. 40, no. 1, p. 110-113. ISSN: 2212-8271.

PONGRÁC, B.; KRČMA, F.; DOSTÁL, L.; KIM, H.,H.;,HOMOLA, T.; MACHALA, Z. Effects of corona space charge polarity and liquid phase ion mobility on the shape and velocities of water jets in the spindle jet and precession modes of water electro- spray. *JOURNAL OF AEROSOL SCIENCE,* 2016, vol. 101, no. 1, p. 196-206. ISSN: 0021-8502.

VESELKA, F. Studium kluzného kontaktu a výzkum komutace (1.-3. část). *Electro,* 2016, č. 8- 11, s. 96-98. ISSN: 1210-0889.

BERNARD, V.; ANDRAŠÍNA, T.; ČERVINKA, D.; MARTIŠ, J.; PROCHÁZKA, P.; MORNSTEIN, V.; VÁLEK, V. A Thermographic Comparison of Irreversible Electroporation and Radiofrequency Ablation. *IRBM,* 2016, vol. 38, no. 2, p. 1-8. ISSN: 1959-0318.

VOREL, P.; ČERVINKA, D.; PROCHÁZKA, P.; MARTIŠ, J.; TOMAN, M. High Efficiency Fast-Chargers for Lead-Acid Batteries. *ECS Transactions,* 2016, vol. 74, no. 1, p. 23-30. ISSN: 1938-5862.

TOMAN, M.; VOREL, P.; CIPÍN, R.; ČERVINKA, D.; PROCHÁZKA, P. Li- ion battery charging efficiency. *ECS Transactions,* 2016, vol. 74, no. 1, p. 1-4. ISSN: 1938-5862.

CIPÍN, R.; PROCHÁZKA, P.; TOMAN, M.; MARTIŠ, J.; ČERVINKA, D. Automatic Li- ion Accumulator Measuring Stand. *ECS Transactions,* 2016, vol. 74, no. 1, p. 77-83. ISSN: 1938-5862.

PROCHÁZKA, P.; ČERVINKA, D.; MARTIŠ, J.; CIPÍN, R.; VOREL, P. Li- Ion Battery Deep Discharge Degradation. *ECS Transactions,* 2016, vol. 74, no. 1, p. 1-4. ISSN: 1938-5862.

MARTIŠ, J.; VOREL, P.; CIPÍN, R.; PROCHÁZKA, P.; TOMAN, M. Compact High-efficiency Li-Ion Fast- charger. *ECS Transactions,* 2016, vol. 74, no. 1, p. 1-6. ISSN: 1938-5862.

Bachelor's Courses

Počítače a programování 1
(prof. RNDr. Vladimír Aubrecht, CSc.)

Automobilová elektrotechnika
(prof. Ing. Vítězslav Hájek, CSc.)

Informatika v silnoproudé elektrotechnice
(Ing. Marcel Janda, Ph.D.)

Řídicí elektronika
(doc. Dr. Ing. Miroslav Patočka)

Výkonová elektronika
(doc. Dr. Ing. Miroslav Patočka)

Elektrické stroje 2
(doc. Ing. Ondřej Vítek, Ph.D.)

Elektrické přístroje
(doc. Ing. Bohuslav Bušov, CSc.)

Inspekční a revizní činnost
(doc. Ing. František Veselka, CSc.)

Elektrické stroje
(doc. Ing. Čestmír Ondrůšek, CSc.)

Mikroprocesorová technika v pohonech
(Ing. Ivo Pazdera, Ph.D.)

Teorie řízení
(Ing. Petr Huták, Ph.D.)

Počítačová podpora konstruování
(Ing. Marcel Janda, Ph.D.)

Elektrické pohony
(Ing. Dalibor Červinka, Ph.D.)

Master's Courses

Dynamika elektromechanických soustav
(doc. Ing. Čestmír Ondrůšek, CSc.)

Elektrické regulované pohony
(Ing. Dalibor Červinka, Ph.D.)

Technika výkonových měničů
(doc. Dr. Ing. Miroslav Patočka)

Navrhování výkonových měničů
(doc. Dr. Ing. Miroslav Patočka)

Počítačové modelování v silnoproudé elektrotechnice
(Ing. Marcel Janda, Ph.D.)

Adaptivní a optimální řízení pohonů
(Ing. Petr Huták, Ph.D.)

Řízení dynamických soustav
(Ing. Petr Huták, Ph.D.)

Diagnostika a jištění elektrických zařízení
(Ing. Jiří Valenta, Ph.D.)

Laboratoře elektrických strojů a přístrojů
(Ing. Marcel Janda, Ph.D.)

Projektové řízení inovací
(doc. Ing. Bohuslav Bušov, CSc.)

Průmyslová elektronika
(doc. Ing. Pavel Vorel, Ph.D.)

Řídicí členy v elektrických pohonech
(doc. Ing. Pavel Vorel, Ph.D.)

Střídavé pohony
(Ing. Ivo Pazdera, Ph.D.)

Stavba a výroba elektrických přístrojů
(doc. Ing. Bohuslav Bušov, CSc.)

Elektrické mikropohony
(doc. Ing. Ondřej Vítek, Ph.D.)

Mikropočítačové řízení elektrických pohonů
(Ing. Ivo Pazdera, Ph.D.)

Ph.D.Courses

Vybrané statě z elektrických strojů a přístrojů
(doc. Ing. Čestmír Ondrůšek, CSc.)

Vybrané statě z výkonové elektroniky a elektrických pohonů(prof. Ing. Jiří Skalický, CSc.)

Laboratories

Laboratory of Electrical Machines (research on commutation of electrical machines, measurement of medium-power output, magnetic bearings, automated measurements, Ondřej Vítek)

Laboratory of Mechatronics (Ondřej Vítek)

Laboratory of Electrical Devices (switching devices, Bohuslav Bušov)

Laboratory of Holographic Interferometry (optical stand for holographic interferometry, e.g. diagnostics of rotating machine vibrations, Marcel Janda)

Laboratory of Electrical Drives (electrical drives with focus on independent traction, Dalibor Červinka)

Laboratory of Power Electronics (research in pulse converters of different outputs, Petr Procházka)

Laboratory of High-Current Electronics (research on DC/DC converters, alternators and low-voltage brushless drives, Dalibor Červinka)

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

Laboratory of Control Electronics (Pavel Vorel)

Laboratory of Microprocessor Technology (Bohumil Klíma)

Laboratory of Microelectromechanical Systems (Rostislav Huzlík)

Laboratory of Power Electronics 2 (Pavel Vorel)

Research and Development Laboratory (Petr Procházka)

A high voltage source for electroporation of cancer cells