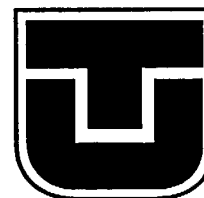


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**Technical University of Košice, Slovakia**  
Faculty of Electrical Engineering and Informatics

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*Annual Report*

*1998*

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**Department of Electrical Drives**  
*Katedra elektrických pohonov*

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## Contents

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## Foreword

The report continues in the series of the Annual reports issued by the Department of Electrical Drives (Katedra elektrických pohonov) in order to present activities during the year 1998. It contains information about position and structure of the department, information about under- and postgraduate courses, overview of students' works, research activities and projects with industry, list of publications, information about the staff members and about scientific and other events organised by the Department in the year 1998.

In the last years the following most important events marked the departmental life:

- 5 research projects were solved and proposals for another three new projects were submitted,
- a new international project within Leonardo da Vinci programme was successfully approved,
- an another research project within NATO for Peace programme was submitted,
- in October we took part in the exhibition ELOSYS in Trenčín with 2 equipment: the LON networks with a model transporting liquids and SC drive SIMOREG DC MASTER 6RA, in co-operation with SIEMENS company,
- during the PEMC '98 Conference in Prague the PEMC Council finally decided, the next conference PEMC '2000 will be organised in Košice.

There also were some events concerning the personally department staff:

- two staff members celebrated their founded birthday: Doc. Ing. Viliam Fedák, CSc. – 50 anniversary and Prof. Ing. Jaroslav Timko, CSc. – 60 anniversary,
- Ing. Le Quang Duc started to work with us on the post of research fellow,
- five Ph.D. students joined the department,
- two staff members left the Department: Ing. Miroslav Tvrdoň and Ing. Iveta Kochová,
- the end of year was very sad for us: on the 6<sup>th</sup> December Doc. Ing. Jaroslav Tomko, CSc. suddenly died. God blessed him.

The description in this brochure is necessarily brief and further information can be obtained by contacting the department or the person concerned. Further details can also be also in homepage on Internet (<http://www.tuke.sk/fei-kep>).

Doc. Ing. Jozef Fedor, CSc.  
Head of the Department

## 1. Introduction

The Faculty of Electrical Engineering and Informatics (FEI) of the Technical University of Košice was founded in 1969. Since its establishment 6497 students graduated at the faculty (in 1998 there were 466 brand new graduates). Currently there are about 2040 undergraduate and 64 postgraduate students. The faculty staff consists of 238 members, among them 13 full professors, 54 associate professors, 105 assistant professors, 11 assistants and 23 research workers.

The Faculty offers full university education in five-year undergraduate courses (M.Sc. degree, with the title Ing.). After finishing two years of study filled by basic general subjects and main subjects from electrical engineering, in subsequent years the students can choose their specialisation. At the end of the engineering courses, students defend graduate theses (diploma works). The FEI offers also other types of education: three-year B.Sc. (undergraduate) courses and three-year Ph.D. (postgraduate) courses.

The Department of Electrical Drives - Katedra elektrických pohonov (KEP) is one of the 11 units of the FEI (10 departments and 1 specialised laboratory). The Department is responsible for education in subjects concerning the electrical engineering. The main aim is to prepare undergraduate students for their career both in industry and research. The Department offers both types of undergraduate courses (M.Sc. and B.Sc.) as well as the Ph.D. postgraduate course.

Since the faculty establishment in 1969, totally 1460 students graduated at the Department.

The students are studying at the Department since the third year of their study: in the current 1998/99 academic year there are totally 79 students studying at the department (18 students in the third year, 33 in the fourth and 28 students in the fifth year).

The Department offers also postgraduate education. Since its establishment, 34 postgraduate students have defended successfully their dissertations and were awarded by the CSc. degree (equivalent to a Ph.D. degree). There are 9 supervisors within the Department specialised in different fields of electrical engineering. The current number of full- and part-time Ph.D. students is 19.

The Department is strong involved in teaching of the electrical engineering subjects for students studying at other faculties of the Technical University. The number of students from Faculty of Mechanical Engineering (SjF) reaches 417, Faculty of Mining Engineering (FBERG) - 270 and Faculty of Metallurgical Engineering (HF) - 210.

## 2. Structure of the Department

The current number of staff members is 35; among them 27 full academic staff members, 3 researchers and 5 supporting and technical staff. The department is divided into 3 divisions, according to the field of specialisation:

- Division of Electrical Drives,
- Division of Industrial Electronics and Automation,
- Division of Electrical Machines and Apparatus.

An overview over divisions of the department is given in the table:

<b>Head of Department:</b>	<i>Jozef Fedor</i>
<b>Deputy Head of Department:</b>	<i>Viliam Fedák</i>

### Divisions:

Electrical Drives	Industrial Electronics and Automation	Electrical Machines and Apparatus
<i>Jaroslav Tomko (+ 6.12.1998)</i>	<i>Jaroslav Dudrík</i>	<i>Pavel Záskalický</i>
Jaroslav Timko	Irena Kováčová	Jozef Fedor
Ladislav Zboray	Jozef Ondera	Bartolomej Fedor
Viliam Fedák	Peter Višnyi - research worker	Želmíra Ferková
Ján Fetyko		Ján Kaňuch
František Ďurovský	Pavol Fedor	Michal Kostelný
Jaroslava Žilková	Stanislav Fedor	Juraj Németh
Vladislav Maxim	Daniela Perduková	
Dionýz Milly	Rastislav Harčarufka	
Le Quang Duc - research fellow	Katarína Harčarufková -res.work.	
Full-time Ph.D. students:	Full-time Ph.D. students:	
Dušan Balara	Peter Dzurko	
Ladislav Balara		
Martin Frena		
Stanislav Kron		
Tibor Takáč		
Branislav Zmrík		

Support and Technical Staff
Veronika Majerníková
Katarína Gočová
Vasil' Graban
Alena Jakobová
Štefan Záhorjan

## 3. Courses offered in 1998/99

### 3.1 M.Sc. (Undergraduate) Course (5 years)

The students are taught at the Department since the third year of study and are specialised according to their interest by choosing the optional subjects from the list. In such way they approach more-or-less to the specialisation:

1. Electrical Drives,
2. Power Electronics,
3. Electrical Machines and Apparatus,
4. Automation of Electrical Equipment.

#### 1. Electrical Drives

Students are prepared for design and operation of electrical drives used to drive various working machines and mechanisms. During study period the students are also acquainted with knowledge of power and control electronics and computer techniques, control of single and multi-motor electromechanical systems (robots, manipulators and technological lines).

#### 2. Power Electronics

Power Electronics is dealing with control and transformation of electrical energy from an available form into a required form. Besides the fundamental subjects the students are prepared for analysis, modelling, design, construction, and control of power semiconductor converters. They receive deeper knowledge from electronics, esp. digital electronics.

#### 3. Electrical Machines and Apparatus

The students are taught theory, design, technology and construction of electrical machines and apparatus using classical and computer - aided design methods.

#### 4. Automation of Electrical Equipment

The stress is focused on subjects concerning electronics and microelectronics, advanced control theory, computer technique, design of control and regulation for complex systems, both from the HW and SW points of view. The goal of the study is to prepare students to design and maintain the control systems of technological processes.

### Overview of the M.Sc. (Undergraduate) Course Programme

#### The Third Year

Duration: 14 + 14 weeks

<u>Option</u>	Semester:	5 <sup>th</sup>	6 <sup>th</sup>	N° of
Subject		Lect./Lab.		credits Lecturer
<u>Compulsory Subjects</u>				
Social Sciences		0/2 ca		3
El.Energy Transmission and Distribution		3/3		6
Electrical Machines		3/3 ex		7 Kostelný

**Optional Subjects** (students choose min. 3 subjects from the following)

Control Theory	2/2 ex	5	Bučko
Applied Electronics	2/3 ex	5	Kováčová
Control Systems Software	2/2 ex	4	Timko, Harčarufka
Electromechanical Systems	2/2 ex	4	Fedák, Fetyko
Applied Mathematics	2/2 ex	4	Pirč, Schrötter
Optional Subject from the Faculty List			

**Compulsory Subjects**

Electrical Apparatus	3/2 ex	6	Fedor J.
Shortcircuits and Stability in El. Networks	3/3 ex	7	Chladný

**Optional Subjects** (students choose min. 2 subjects)

Power Electronics	3/3 ex	6	Dudrřk
Electrical Machines II.	3/3 ex	6	Kostelný
Components of Digital Control Systems	3/3 ex	5	Fedor P., Perduková
Mechatronics Fundamentals	2/3 ex	5	Fetyko
Optional Subject from the Faculty List			

Required number of credits per year 60

**The Fourth Year**

Duration: 14 + 14 weeks

Option Subject	Semester:	7 <sup>th</sup> Lect./Lab.	8 <sup>th</sup> Lect./Lab.	N <sup>o</sup> of credits	Lecturer
<b>Compulsory Subjects</b>					
Economy I.		0/2 ca		3	
<b>Optional Subjects</b> (students choose min. 5 subjects)					
Electrical Drives		3/3 ex		7	Timko
State Control of Electrical Drives		2/3 ex		6	Zboray
Control Circuits for Power Electronics		2/3 ex		6	Dudrřk, Viřnyi
Electrical Machines Design		3/2 ex		6	Ferková
Control Systems Design		2/3 ex		6	Girman, Bober
Industrial Systems Identification		2/3 ex		6	Fedák
Computer Aided Design		2/3 ex		6	Fedák, Kařuch
Applied SW in Electrical Engineering		2/3 ex		4	Dudrřk, Fedák
El. Equipment of the Cars		2/2 ex		4	Đurovský
User Interfaces in Control Systems		2/2 ex		4	Fedor P., Perduková
Optional Subject from the Faculty List					

**Compulsory Subjects**

Economy II.	0/2 ca	2
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**Optional Subjects** (students choose min. 5 subjects)

Controlled Drives	3/3 ex	7	Zboray
Automation of Electrical Equipment	3/3 ex	7	Fedor P.

Electrical Machines Construction	3/2 ex	6	Fedor J.
Electrical Drives Design	2/3 ex	6	Tomko, Milly
Complex Drive Systems	2/3 ex	6	Fedák
Power Semiconductor Converters	2/3 ex	6	Ondera
High-Voltage Technique	3/2 ex	7	Marton
Computer Aided Design	0/2 ca	2	Fedor S.
Power Electronics Laboratory Practice	0/2 ca	2	Fedor S.
Optional Subject from the Faculty List			

Required number of credits per year 60

**The Fifth Year**

Duration: 14 + 10 weeks

Option Subject	Semester:	9 <sup>th</sup> Lect./Lab.	10 <sup>th</sup> Lect./Lab.	N <sup>o</sup> of credits	Lecturer
<b>Compulsory Subjects</b>					
Master Thesis Seminar		0/5 ca		5	
<b>Optional Subjects</b> (students choose min. 5 subjects)					
Special El. Machines and Apparatus		3/2 ex		6	Kostelný, Fedor J.
Semiconductor Converters Applications		2/3 ex		6	Ondera
Control of Robots and Manipulators		2/3 ex		6	Fetyko
Control Systems of Technological Lines		2/3 ex		6	Fedor P., Harčarufka
Industrial Drives		2/3 ex		6	Tomko
Electrical Equipment Design		2/2 ex		4	Dudrřk, Fedor S.
Microcomputer Control of Converters		2/2 ex		5	Viřnyi
Separators and Neutralisators		2/2 ex		4	Marton
Optional Subject from the Faculty List					
Master Thesis (Diploma Work)			x	30	
Required number of credits per year				60	

The Department of Electrical Drives ensures teaching of specialised subjects in other lines of study at the FEI and is also responsible for teaching of the following subjects in field of electrical engineering at other faculties of the Technical University:

Faculty of:

- El.Eng.&Info: Technical Documentation in El. Engineering, Microprocessors, Electrical Apparatus, Electrical Drives, Controlled Drives, Electronic Elements, Electrical Machines, Electrical Drives and Power Electronics
- Mechan.Eng: Electrical Engineering, Special Electrical Drives
- Mining Eng.: Electrical Engineering
- Metall.Eng.: Electrical Engineering

### 3.2 B.Sc. (Undergraduate) Course (3 years)

The new B.Sc. Course Electrical Engineering was designed with the aim to educate the students to meet industrial requirements. In this course the students will:

- receive fundamental theoretical knowledge in mathematics, physics, electromechanics and also in electrical engineering, power electronics, electrical drives and computers,
- get practical skills with design of circuits and subsystems, mainly in power semiconductor converters, motors and controlling systems of the drives,
- obtain knowledge in economics and business.

During the study period there are two practices (called: engineering applications - EA):

- EA I. (4 weeks of work at the department) in the first academic year,
- EA II. (3 weeks at department + 3 weeks in industry) in the second year.

#### Overview of the B.Sc. (Undergraduate) Course Programme

##### First Year

Duration: 14 + 14 weeks + 4 weeks EA I.

Option Subject	Semester:	1 <sup>st</sup> Lect./Lab.	2 <sup>nd</sup> Lect./Lab.	N <sup>o</sup> of credits	Lecturer
Fundamentals of Electrical Engineering		3/1 ex		3	Orendáč
Mathematics I.		4/3 ex		8	Skřivánek
Physics		3/2 ex		6	Ziman
Computers and Programming I.		2/2 ex		5	Ábel
Technical Documentation in El. Engineering		2/1 ca		3	Řurovský
Theoretical El. Engineering			3/3 ex	7	Šimko
Mathematics II.			3/3 ex	7	Skřivánek
Computers and Programming II.			2/2 ex	5	Ábel
Electrical Measurement			2/2 ex	6	Mojžiš
Electronics			3/3 ex	6	Marchevský
Foreign Language:		0/2 ca	0/2 ca	-	
EA I. in duration of			4 weeks	4	
<i>Required number of credits per year</i>				60	

##### Second Year

Duration: 14 + 14 weeks + 6 weeks Praxis II.

Option Subject	Semester:	3 <sup>rd</sup> Lect./Lab.	4 <sup>th</sup> Lect./Lab.	N <sup>o</sup> of credits	Lecturer
Economics		2/2 ex		3	
Electrical Machines		3/3 ex		7	Kostelný

Power Electronics I.	3/3 ex	7	Dudřík
Microprocessor Technology	2/2 ex	4	Girman
SW for Simulation in Electrical Engineering	1/3 ex	4	Dudřík, Fedák
Electrical Machines and Apparatus	3/3 ex	6	Kostelný, Fedor J.
Power Electronics II.	3/3 ex	6	Dudřík
Automation of Electrical Equipment	3/3 ex	6	Fedor P.
Electrical Drives	4/4 ex	6	Timko
Economics	2/2 ex	3	
Foreign Language	0/2 ex	2	
EA II. in duration of	6 weeks	5	
<i>Required number of credits per year</i>			60

##### Third Year

Duration: 14 + 14 weeks

Option Subject	Semester:	5 <sup>th</sup> Lect./Lab.	6 <sup>th</sup> Lect./Lab.	N <sup>o</sup> of credits	Lecturer
<u>Compulsory Subjects</u>					
Business and Management Studies I.		2/2 ca		5	
Power Engineering I.		2/2 ex		5	Ilenin
Final Project		0/2 ca		2	
<u>Optional Subjects</u> (students choose min. 3 subjects)					
Automatised Electrical Drives I.		3/3 ex		8	Tomko
Power Semiconductor Systems I.		3/3 ex		8	Dudřík
Electrical Drives Design		2/2 ex		5	Milly
Control Systems in Industrial Lines		2/2 ex		5	Girman
Robots and Manipulators		2/2 ex		5	Fetyko
Electromechanical Systems		2/2 ex		5	Fetyko, Fedák
<u>Compulsory Subjects</u>					
Business and Management Studies II.			2/2 ca	5	
Power Engineering II.			2/2 ex	5	Kolcun
Final Project			0/7 ca	7	
<u>Optional Subjects</u> (students choose min. 2 subjects)					
Automatised Electrical Drives II.		3/4 ex		8	Fetyko
Power Semiconductor Systems II.		3/3 ex		8	Ondera
Design of Electrical Drives		2/2 ex		5	Tomko, Milly
Industrial Drives		2/2 ex		5	Tomko
Control of Quality and Reliability		2/2 ex		5	
<i>Required number of credits per year</i>				60	

Abbreviations: ex = exam, ca = continuing assessment

### 3.3 Ph.D. (Postgraduate) Course (3 years)

Students with a Master's Degree (Ing.) can apply for a postgraduate course lasting three years. According to the Notice No 131 of the Ministry of Education of Slovak Republic, the Ph.D. study continues in the branch of study 26-32-9 Electrical Engineering, particularly in one from the following specialisation:

- Electrical Drives,
- Electrical Machines and Apparatus,
- Power Electronics.

The postgraduate program is divided into two parts. After 18 months there is a defence of an overview work on topic of the dissertation accompanied by an exam from the specialised subjects chosen by the supervisor. The further study is concentrated on research only. The course is finished by a public defence of the dissertation in the end of the third year.

### 4. Current Research Projects

The research activity at the Department of Electrical Drives is generally concentrated on

- CAD of electrical machines and apparatus,
- controlled electrical drives,
- power electronics converters with improved dynamic properties,
- applications of control theory and computers to control of complex drive systems, multi-motor drives of manufacturing lines, industrial plants and robots,
- microcomputer implementation of control algorithms.

Scientific research is carried out in collaboration with national authorities and industry.

The following research projects were carried out at the Department in 1998 year:

1. Special Electrical Drives of Low Power Rating.
2. Development of Control Algorithms for Non-Linear and Multi-Motor Drives.
3. Advanced Control Methods in Field of Industrial Automation.
4. Power Semiconductor Converters with Reduced Switching Losses.
5. Control of Multi-Motor Electromechanical Systems.
6. Design of Reluctance Machines with Unsymmetrical Structures
7. Controlled Drives

### 1. Special Electrical Drives of Low Power Ratings

Research project N° 41152 based on institutional granting.

Duration: 1996-98

Co-ordinator: Michal Kostelný

Members: Bartolomej Fedor, Ján Kaňuch, Pavel Záskalický

Goals of the project: To design and investigate properties switched reluctance and step motors.

Research activity of the group is concentrated on:

- development and realisation of the switched reluctance motor (SRM) with axial magnetic field,
- development of a step motor with axial magnetic field,
- design of new structures of switched reluctance and step motors,
- optimisation of switching processes; calculation of currents and torque.

Publications: [K11], [K17]

### 2. Development of Control Algorithms for Non-Linear and Multi-Motor Drives

Supported by: grant N° 1/4025/97 of the Grant Agency for Science (VEGA).

Duration: 1997-99

Co-ordinator: Pavol Fedor

Members: Stanislav Fedor, Rastislav Harčarufka, Katarína Harčarufková, Daniela Perduková (70 %)

The project deals with two basic topics:

- Methodology of control circuit design for one- and multi-motor drives, synthesis of regulators for asynchronous motor drives using Lyapunow theory and applying fuzzy regulators to control the drives.
- Development of environment for control systems based on transputer network. Design and debugging of software tools for modelling, monitoring and control of complex drive systems.

Publications: [J3], [C5], [K8], [K9], [K10]

### 3. Advanced Control Methods in Field of Industrial Automation

Supported by grant N° 1/3204/96 of the Grant Agency for Science (VEGA).

Duration: 1996 - 1998

Co-ordinator: Jaroslav Timko

Members: Dušan Balara, Marcela Halušková, Peter Bober, Michal Girman, Peter Košč, Irena Kováčková (66%), Daniela Perduková (30%), Jaroslava Žilková

Goals of the project: To adapt the modern control methods (fuzzy controllers, neural networks, adaptive controllers and controllers with variable structures) to chosen industrial drives.

Research activity of the group is concentrated on:

- applications of neural networks in control and identification of electrical drives,
- control of AC drives,
- modernisation of converters considering the electromagnetic compatibility.

Publications: [J1], [C1], [C11], [C12], [C16], K4]

#### 4. Power Semiconductor Converters with Reduced Switching Losses

Supported by grant N° 1/3210/96 of the Grant Agency for Science (FEI code 9440).

Duration: 1996 - 1998

Co-ordinator: Jaroslav Dudrřk

Members: Jozef Ondera, Imrich Pokorný, Peter Viřnyi

Ph.D. student: Peter Dzurko

Goals of the project: To develop, investigate and verify connection of converters for various applications while taking into considerations decrease of switching losses in power semiconductor devices working at high frequencies.

Research activity of the group is concentrated on:

- design and development of a three-phase frequency converter with the resonant link,
- debugging of models of indirect DC converters,
- design and realisation of laboratory prototype of DC converter with possibility to modify various structures and different control methods.

Publications: [J2], [C2], [K1], [K2]

#### 6. Control of Multi-Motor Electromechanical Systems

Supported by grant N° 1/3203/96 of the Grant Agency for Science (FEI code 9439).

Duration: 1996 - 1998

Co-ordinator: Ján Fetyko (33 %)

Members: Ján Čverřko (VSŽ Oceř, Kořice), Frantiřek řurovský (33%), Viliam Fedák, Vladislav Maxim (33%), Dionýz Milly (33%), Jaroslav Tomko (33%), Ladislav Zboray (33 %).

Ph.D. students: Ladislav Balara, Martin Frena, Stanislav Kron, Tibor Takáč, Branislav Zumřk

Goals of the project: To develop and adapt the modern control theory (non-adaptive, adaptive and optimal state control methods) for multi-motor electromechanical systems (robots, manipulators and continuous technological lines).

To find a suitable drive for various applications of vibrating machines and mills and to design suitable control circuits for them.

Publications: [C17], [C18]

Research activity of the group is concentrated on:

- setting-up of models for chosen electromechanical systems (continuous strip finishing rolling mill, processing lines and robot with 6 degrees of freedom),
- development of modern control methods for multi-motor electromechanical systems,
- verification of designed control structures,
- comprehensive preparation of the topic.10

Publications: [J4], [C3], [C4], [C7], [C8], [C9], [C10] [C13], [C14], [K5], [K6], [K7], [K14], [K15], [K16], [H1], [H2]

#### 7. Design of Reluctance Machines with Unsymmetrical Structures

Supported by grant N° 5004/98 of the Grant Agency for Science (VEGA).

Duration: 1998- 2000

Co-ordinator: Pavel Záskalický

Members: Michal Kostelný, Jozef Fedor, Ján Kaňuch, Bartolomej Fedor

Goals: To design and investigate properties switched reluctance and step motors with dissymmetrical structures.

Goals of the project:

- Design of new structures of switched reluctance and step motors,
- Optimisation of switching processes; calculation of currents and torque.

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Results:

- Linear theory of the Switched reluctance motors.
- General theory on non-symmetrical structures SRM and step motors.
- Optimisation of the switching angle by linearisation of the magnetic curve.
- Optimisation of switching angle by non-linear replaces of the inductances.

#### 8. Controlled Drives

Project N° 41152 based on institutional granting.

Duration: 1998-99

Co-ordinator: Ladislav Zboray

Goal of the project: To prepare a book on the topic.



## 5. Publications in 1998

### 1. Monographies

### 2. Teaching Books and Teaching Materials

- [T1] Harčarufka,R. - Harčarufková,K.-Perduková,D.: Základy práce v PowerPointe 7.0. (Fundamentals of Working in PowerPoint 7.0). STU Bratislava, 1998, 188 p., ISBN 80-227-1121-7 (in Slovak)
- [T2] Benedikovič,M. - Harčarufka,R.-Harčarufková,K. et al: Základy práce v Internete. (Fundamentals of Working in Internet). STU Bratislava, 1998, 113 p., ISBN 80-227--1122-5 (in Slovak)
- [T3] Alexík,M. - Harčarufková,K. - Perduková,D. et al: Textový editor MS Word (Text Editor MS Word). STU Bratislava, 1998, 212 p., ISBN 80-227--1138-1 (in Slovak)

### 3. Papers in the Specialised Journals

- [J1] Balara,D. - Timko,J.: The State-Differential Method for Adaption of Parametric Models. Neural Network World, Praha 1998
- [J2] Dudrík,J. - Dzurko,P.: Rezonančné meniče pre oblúkové zváranie. (Resonant Converters for Arc Welding). Variations. Časopis Elektro No 7-8, (1998), pp.8-11
- [J3] Fedor,P - Fričovský,P.: Riadenie elektrárenského bloku riadiacim systémom Damatic Xdi. (Control of a Block in Power Station by Control System Damatic Xdi). Riadiace systémy, Journal 8, (1998), pp.28-41
- [J4] Zboray,L. - Balara,L.: State Control with Decreased Sensitivity to Parameter.

### 4. Contributions at the International Conferences

- [C1] Balara,D. - Timko,J.: Estimation of Induction Motor Parameters Using Neural Networks Principles. In: Proc. of Int. Conf. PEMC '98, Praha, 1998, pp.6-9
- [C2] Dudrík,J. - Dzurko,P.: Series-Parallel Resonant DC-to-DC Converter for Arc Welding. In: Proc. of Int. Conf. PEMC '98, Praha, 1998, pp.16-20
- [C3] Ďurovský,F. - Tomko,J.: A Thermal Model of Steel Strip in Continuous Annealing Line Based on Electroanalogy Method. In: Proc. of Int. Conf. microCAD '98, Miskolc, 1998, pp.3-7
- [C4] Fedák,V. - Frena,M.: State Control Multi-Mass Electromechanical Systems. In: Proc. of Int. Conf. microCAD 98, Miskolc, 1998, pp.35-39
- [C5] Fedor,P. - Perduková,D.: Informačný systém menšej teplárne na báze PC. (PC based Information System for a Smaller Power Station). In: Proc. of Conf. Process Control '98, Kouty nad Desnou, 1998, pp.66-68
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### Contributions at Domestic Conferences and Seminars

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- [K2] Dudrík,J.: Converters With Reduced Switching Losses. Conf. of Faculty of EE&I, Košice, 1998, pp. 23-24
- [K3] Fedor,P. - Perduková,D.: Fuzzy riadenie kontinuálnej linky. (Fuzzy Control of Continuous Line). In: Proc. of Int Conf. ICAMC '98, the High Tatras, 1998, pp.463-466

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#### 4. Other Publications

##### Patent Submitted

- [P1] Višnyi,P.: Spínacia jednotka s výkonovými tranzistormi. (A Switching Unit with Power Transistors).

#### Project Reports

- [H1] Čverčko,J. - Tomko,J. - Čecho,L.: Záverečná správa výskumnej úlohy V-42 „Simulácia dynamických režimov vybraných agregátov Sva“ (Final Report of the Research Project "Simulation of Dynamic States of Chosen Machines at the Cold Mill Factory"), VSŽ, a.s., Košice, 1998
- [H2] Tomko,J. - Fetyko,J. - Ďurovský,F. - Milly,D. - Maxim,V. - Takáč,T.: Správa k ZoD č.16/0415/97 „Štúdia napájania hlavných valcovacích motorov hotovného poradia TŠP-1700 DZ Teplá valcovňa“, (Report „A Study of Rolling Motors Supply for Hot Strip Tandem Mill), VSŽ, a.s. Košice, 1998.

## 6. Information about Staff Members

### 1. Fields of Research Interests of the Teaching Staff Members

**Jaroslav Timko**, Professor (Prof. Ing., CSc.)

Control of AC drives (also linear ones) fed by power electronic frequency converters. Applications of neural networks in electrical drives.

**Ladislav Zboray**, Professor (Prof. Ing., CSc.)

Non-linear state control methods and their application to the control design of drive systems.

**Jaroslav Dudrůk**, Associate Professor (Doc. Ing., CSc.)

Analysis, design and control of static power converters. High-frequency resonant and soft switching DC/DC converters.

**Viliam Fedák**, Associate Professor (Doc. Ing., CSc.)

Application of the advanced control theories for control of single- and multi-motor drives. Systems identification. Modelling of electromechanical systems.

**Jozef Fedor**, Associate Professor (Doc. Ing., CSc.)

Switching electrical circuits and switching apparatus. Applications of power semiconductor devices and circuits for a switching techniques.

**Pavol Fedor**, Associate Professor (Doc. Ing., CSc.)

Software for control and new control methods of electrical drives, parallel and distributed programming and application software for transputer system.

**Ján Fetyko**, Associate Professor (Doc. Ing., CSc.)

Control of electrical drives. Electric servosystems for robots Non-adaptive and adaptive control of industrial robots. Mechatronics

**Irena Kováčová**, Associate Professor (Doc. Ing., CSc.)

Modern power semiconductor switching devices (MOSFET, IGBT, PIN diodes) and their application in power converters.

**Michal Kostelný**, Associate Professor (Doc. Ing., CSc.)

Design of electrical machines, esp. switched reluctance motors of various types (with radial and axial air-gap).

**Jozef Ondera**, Associate Professor (Doc. Ing., CSc.)

Design and control of power semiconductor converters. Design of direct-current converter. Applications of converters for illuminating engineering and battery chargers.

**Pavel Záskalický**, Associate Professor (Doc. Ing., CSc.)

Structures of reluctance step motors. Linear theory of reluctance motors. Optimisation of supply and power losses calculation.

**František Ďurovský**, Assistant Professor (Ing., CSc.)

Control of electric drives, esp. state-space control. Design of non-linear observers. Design and debugging of programs for digital control of electrical drives.

**Bartolomej Fedor**, Assistant Professor (Ing., CSc.)

Switching of electrical circuits, switching devices and equipment. Application of power semiconductor devices in switching circuits.

**Stanislav Fedor**, Assistant Professor (Ing.)

Computer control. Surface-mounting and hybrid technologies. Design of measuring instruments for testing and diagnostic of energetic devices.

**Želmíra Ferková**, Assistant Professor (Ing., CSc.)

Magnetic fields in electrical machines, esp. in switched reluctance motors.

**Rastislav Harčarufka**, Assistant Professor (Ing.)

Software for real-time systems with parallel or distributed architecture, based on conventional processors and/or transputers, CAD, CASE -technologies, parallel programming, and languages.

**Ján Kaňuch**, Assistant Professor (Ing.)

Design of disk step motor and disk reluctance motor. Application of CAD methods in design of electrical machines and devices.

**Vladislav Maxim**, Assistant Professor (Ing., CSc.)

Design of power components for switched reluctance drives (SRD). Analysis of SRD using PC. Simulating in Pspice.

**Dionýz Milly**, Assistant Professor (Ing., CSc.)

Frequency converters with sinusoidal input and output currents. Control circuits for power converters. Power factor compensation. Switched sources.

**Juraj Németh**, Assistant Professor (Ing., CSc.)

Models of frequency controlled AC machines, esp. with field vector oriented control. Control of electrical drives for vibration machines.

**Daniela Perďuková**, Assistant Professor (Ing., CSc.)

Design methods and control structures for multi-motor drives. Model reference control systems.

**Miroslav Tvrdoň**, Assistant Professor (Ing.)

Switched reluctance motors with disc rotor. Magnetic fields solution using finite elements method.

**Jaroslava Žilková**, Assistant Professor (Ing.)

Applications of neural networks in electrical drives.

## 2. Fields of Research Interests of Research Workers

**Peter Višnyi**, (Ing., CSc.)

Digital speed and position control of electric machines Extremely high dynamic performance and precise electrical drives of small power.

**Katarína Harčarufková**, (Ing.)

Real-time and programming of industrial control systems. Computer-aided control application. New education technologies (flexible-distance education, computer-based learning, etc).

## 3. Supported and Technical Staff

**Alena Jakobová** - technician

**Katarína Gočová** - economist

**Vasiľ Graban**, (Ing.) - technician

**Veronika Majerníková** - secretary

## 7. Current Ph.D. students (in 1998/99)

**Bandurčín Luboš** external form

topic: Neural Networks Applications in Electrical Drives

supervisor: Ladislav Zboray

**Dušan Balara**, full-time Ph.D. student

topic: Neural Networks Applications in Electrical Drives

supervisor: Jaroslav Timko

**Ladislav Balara**, full-time Ph.D. student

topic:

supervisor: Ladislav Zboray

**Peter Dzurko**, full-time Ph.D. student

topic: High-Frequency DC-DC Power Converter

supervisor: Jaroslav Dudrík

**Štefan Fedák**, part-time, external form

topic:

supervisor: Jaroslav Timko

**Martin Frena**, full-time Ph.D. student

topic: Control of Multi-Motor Electromechanical Systems

supervisor: Viliam Fedák

**Jozef Gál**, full-time Ph.D. student  
topic: Control of Multi-Motor Electromechanical Systems  
supervisor: Viliam Fedák

**Ján Gula**, part-time, external form (VSŽ Košice)  
topic: Control of Technological Lines using Neural Networks  
supervisor: Jaroslav Timko

**Rastislav Harčarufka**, part-time, Assistant Professor  
topic: Fuzzy Control of Synchronous Motor Drive  
supervisor: Pavol Fedor

**Stanislav Kron**, full-time Ph.D. student  
topic:  
supervisor: Ján Fetyko

**Tibor Takáč**, full-time Ph.D. student  
topic: Design of Vibrating Mill  
supervisor: Jaroslav Tomko

**Branislav Zmrík**, full-time Ph.D. student  
topic:  
supervisor: Viliam Fedák

**Le Quang Duc**, part-time Ph.D. student  
topic: Control of a Drive with SRM for Vibrating Mill  
supervisor: Jaroslav Tomko

**Stanislav Fedor**, Assistant Professor  
topic: Fuzzy Controller with Disturbance Identification according to the Lyapunow Method  
supervisor: Pavol Fedor

**Juraj Németh**, Assistant Professor  
topic: State Control of a VSI-Fed Asynchronous Motor  
supervisor: Jaroslav Tomko

#### Further postgraduates (having finished their study and writing thesis)

**Čverčko Ján**, external form (research worker, VSŽ Košice)  
topic: Adaptive Control of Strip Elongation in the Finishing Cold Strip Mills  
supervisor: Ján Fetyko

**Kaňuch Ján**, Assistant Professor  
topic: Disc Step Motor with Axial Air - Gap  
supervisor: Michal Kostelný

**Jaroslava Žilková**, Assistant Professor  
topic: Control of AC Drive by Neural Network  
supervisor: Jaroslav Timko

## 8. Teaching and Research Laboratories

At the Department there are 19 laboratories. They are used both for research and teaching. The most important are:

- two laboratories for teaching of general electrical engineering subjects,
- two specialised laboratories for power electronics and electronics,
- three computer laboratories for CAD design and simulation in electrical drives, power electronics and electrical machines (ANSYS, MATLAB, PSPice, and other programs),
- two specialised laboratories for electrical drives and servosystems based on industrial systems,
- three laboratories for electrical machines.

## 9. Other Activities

### 9.1 Membership in Professional Organisations

#### 1. International Professional Societies

- EPEA (European Power Electronics and Drives Association - Brussels): Fedák - member
- PEMCA (Power Electronics and Motion Control Association - Budapest) - established in 1996: Fedák, Timko - members of the committee

#### 2. Members of the Programme and Steering Committees of the International Conferences

- PEMC'98, Praha: Timko (vice-chairman), Fedák, Fedor J.

#### 3. National Professional Bodies and Societies

- Joint Slovak Board for the Ph.D. Study in Electrical Engineering: Timko (vice-chairman), Fedák, Fedor J., Zboray - members
- Technical Standards Commissions: Ferková (Electrical Machines), Pokorný (Electrical Devices and Measurement)
- Grant Agency for Technology: Fedák
- SES (Slovak Electrotechnic Society): Fedák, Fedor, J., Fetyko, Kaňuch, Kováčová, Ondera, Pokorný, Timko, Tomko, Zásalický, Zboray - members

## 9.2 Seminars, Conferences and Meetings

### 1. Scientific Seminars at the Department

Each month a scientific seminar is organised by the Department where the results achieved in research and the results of works of Ph.D. students are presented. Some seminars were organised in co-operation with the Slovak Electrotechnical Society they were led by specialists from industry - in order to disseminate information about the current state and advances in industry.

### 2. High-Tech Workshop, Herľany 1998

In May the Neine Scientific Workshop on Advances in Industrial Control was successfully organised by staff members (Harčarufka, Perduková) in the re-training centre of the Technical University in Herľany, near Košice. The workshop has already got a tradition among our graduates and was devoted to exchange the knowledge between the departmental staff and industrial specialists.

## 9.3 International Co-operation

### 1. International Projects

- **Teaching and Training in Electrical Drives and Machines Automation for Under-Use of Modern Computer Methods in the Electrical Engineering Education**  
CEEPUS Network Project No SK-14  
Co-ordinator (Bratislava): Prof. Ľudovít Klug  
Subco-ordinator (Košice): Michal Kostelný  
Organisations involved: TU of Košice, Slovak TU Bratislava, TU Budapest, Silesian TU of Gliwice, University of Ljubljana  
Objective: Exchange of experiences with utilisation modern methods in education and research in Electrical Machines, Power Electrical Engineering, High Voltage Technique, Electromagnetic Compatibility and Testing Methods. Solution of ecological problems, magnetic fields in electrical machines by FEM, solution of electromagnetic compatibility.

The staff members are also involved in the following project co-ordinated by the Technical University of Košice:

- **Flexible Learning and Continuing Education, "FLACE":**  
TEMPUS S\_JEP-11366-96
- **Strategic University Management in Administration, SUMA":**  
TEMPUS S\_JEP-11304-96
- **Professional Improvement of Management in Administration, "PRIMA"**  
TEMPUS S\_JEP-11274-96

### 2. Visits to Foreign Institutions

- SIEMENS Erlangen, Germany (6-9 May) - Tomko J., Ďurovský F., Maxim V. - visit of the enterprise accompanying a group of students.
- Int. Symposium of Electrical Machines Teachers, Brno (19-22 Jan.), Kostelný, Záskalický
- Contact Seminar of Leonardo da Vinci Programme, Brussels (17-22 Jan., Fedák
- PEMC'98 Int. Programme and Steering Committee, Prague }6-9.21, Fedák, Fedor J., Timko
- microCAD'96 Conference, University of Miskolc (25 Feb.), Ďurovský, Maxim, Milly, Takáč, Tomko
- microCAD'96 Conference, University of Miskolc (25-27 Feb.), Fedák, Fedor J., Fetyko
- Int. Conference SPEEDAM'98, Italy(2-6 June), Kováčová
- Visit of secondary schools in Istanbul, (10-17.May), Fedák
- Int. Workshop on Electrical Machines, Prague (27-29 May), Kaňuch
- Seminar, Crete (22 May – 5 June), Hračarufka
- Int. Symposium of the Electrical Drives Teachers, Ostrava (23-25 June), Fedák, Fedor P., Fetyko, Tomko, Žilková
- Int. TEMPUS Workshop, University of Miskolc (30 June), Fedák, Fedor J., Fetyko
- Co-ordinator Meeting of TEMPUS project, France (22-25 July), Harčarufka, Harčarufková, Perduková
- Int. Conference PEMC '98, Prague (8-10 Sept.), Balara, Dudrřk, Dzurko, Fedák, Ferková, Fetyko, Timko, Tomko

### 3. Study Stays Abroad

- Záskalický P. – ENSEM NAcY, 23 NOV.-21 Dec., IMG TEMPUS
- Fetyko J. – University of Miskolc, visiting professor, presenting the subject: SAtate Control of Electrical Drives, Spring Semester

## 10. Joint Projects with Industry

- [H1] „Simulácia dynamických režimov vybraných agregátov Sva“ (Final Report of the Research Project "Simulation of Dynamic States of Selected Machines at the Cold Mill Factory"). VSŽ, a.s., Košice. Co-ordinator: Tomko J.
- [H2] „Štúdia napájania hlavných valcovacích motorov hotovného poradia TŠP-1700 DZ Teplá valcovňa“, (Report „A Study of Rolling Motors Supply for Hot Strip Tandem Mill). VSŽ, a.s. Košice. Co-ordinator: Tomko J.

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