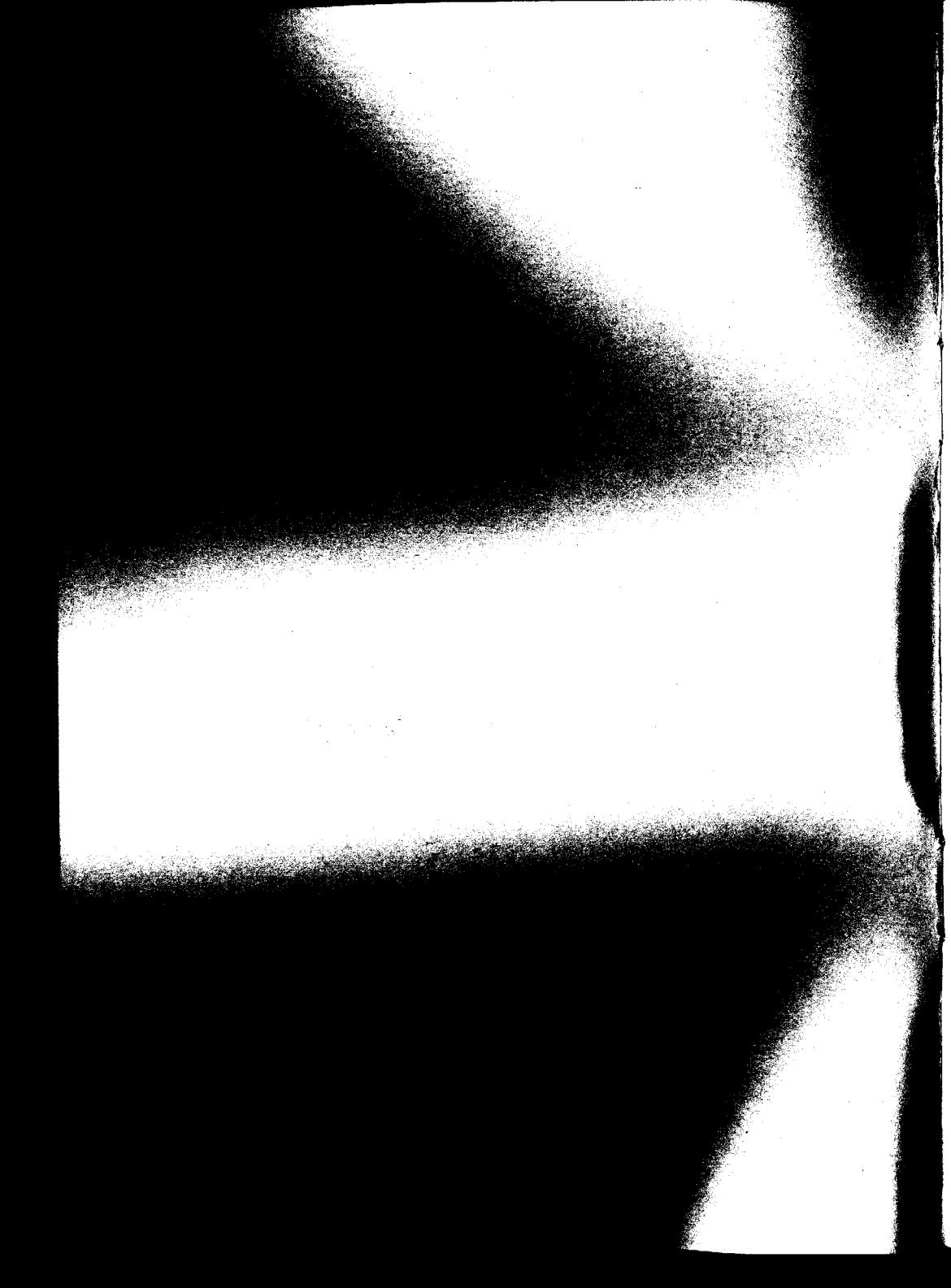

Technical University of Košice,
Slovakia
Faculty of Electrical Engineering and
Informatics

Annual Report

1995

Department of Electrical Drives

Foreword

This brochure serves to give an overview of activities of the Department of Electrical Drives (Katedra elektrických pohonov) with special attention to the current year 1995. It contains basic information about position of the department within the faculty and university, its structure and information about under- and postgraduate courses in the current academic year 1995/96. It outlines research activities and projects with industry, gives a list of publications and information about the staff members - teachers, research workers, and postgraduates, information about scientific and other events organized by the Department during 1995.

The description is necessarily brief and further information can be obtained by contacting the department or the person concerned.

Address of the department:

Department of Electrical Drives
Faculty of Electrical Engineering and Informatics
Technical University
Letná 9
042 00 KOŠICE
SLOVAKIA

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Note: Direct contact to staff members is written in the end of the booklet

Edited by: Assoc. Prof. Viliam FEDÁK, Deputy Head of the Department
Printing: Department of Electrical Drives, Technical University of Košice

Contents

Introduction

An electrical drive presents a complex electro-mechanical system enabling controlled conversion of the energy flow from its electrical form to mechanical one and thus to drive a working machine. The electrical drive is aimed to fulfil various working conditions in technological process - e.g. to have high and prescribed dynamics, to control the torque, speed and position. Its application area is very wide beginning from small drives to drive the hard discs in computers through drives in the household to the drives of large ratings in hot strip mills and gas or water pumps. Also there are various other applications not only of drives but also of power electronics and generally of industrial electronics we meet in every-day life.

To design the drive it is necessary to have deep knowledge not only about electrical machines, but also from fields of microelectronics, power electronics, control theory, computer techniques, and, of course, to know peculiarities of the controlled technological process.

The staff of the department is capable to solve a broad field of tasks concerning the optimal design of electrical machines, power converters, drives, and control systems of the industrial processes.

1. General Information about TUKE and FEI

The Technical University of Košice (TUKE) was established in 1952 to serve the needs of Eastern Slovakia for education and research in technical fields. The University is a publicly supported institution. At presents the total number of students of the university amounts to 8263 (incl. 289 postgraduate students). The TUKE consists of seven faculties:

- Faculty of Mining, Ecology, Control, and Geotechnology Engineering
- Metallurgical Engineering
- Mechanical Engineering
- Faculty of Electrical Engineering and Informatics
- Faculty of Civil Engineering
- Faculty of Specialised Studies (in Prešov)
- Faculty of Economics

The Faculty of Electrical Engineering and Informatics - FEI (new title since April 1994 for former Faculty of Electrical Engineering - FEE) was founded in 1969. Since its establishment more than 5800 students graduated at the faculty. Currently there are about 1910 undergraduate and 120 postgraduate students. The faculty staff consists of 262 members, among them 12 full professors, 49 associate professors, 104 assistant professors, 4 assistants and 21 research workers.

The FEI offers a full university education in five-years courses (Ing. degree). After finishing two years of study filled by basic general subjects and main subjects from electrical engineering, in subsequent years the students can select their own specialisation. At the end of the engineering courses, students defend graduate theses (diploma works). The FEI offers also other types of education: Bc. degree (bachelor) in three-years courses and Dr. Ing. postgraduate education in four-years courses.

2. Information about the Department of Electrical Drives

The Department of Electrical Drives - Katedra elektrických pohonov - KEP (in brochure mostly the abbr. Department is used) is one of the 10 departments of the FEI and it is the largest department within the Faculty. The Department was established simultaneously with the faculty foundation in 1969 by transformation from the original Department of General Electrical Engineering which was founded among the first departments of the TUKE in 1953. In that time it belonged to the

Faculty of Mechanical Engineering. Since the beginning, Prof. František Poliak was appointed on the Chair of Department (till 1979). He also devoted much effort for foundation of the Faculty of Electrical Engineering where he also acted as the first dean.

The Department of Electrical Drives is responsible for education in the field of Electrical Engineering. The main aim is to prepare students for their career in industry and for research. The Department offers Bachelor of Science degree (Bc.), Master of Science (Ing.) and Doctoral (Dr.) degrees. Since the FEE foundation in 1969, in total 1352 students successfully graduated at the Department (in 1994/95 academic year there were 59 brand-new graduates).

The students are studying at the Department since the third year of their study. In 1995/96 academic year there are 29 students in the third year, 37 in the fourth and 39 students in the fifth year of study. Due to recession in industry, number of students has temporarily decreased in last years. The education is supported by modern teaching methods and laboratory equipment. Special attention is given to application of information technologies in control of power converters, electrical drives and industrial plants. Various CAD systems for design of electronic and power electronic circuits, electrical machines and control systems are utilised in the education process.

The Department offers also postgraduate education. Since its establishment, 32 postgraduates have defended successfully their dissertations and were awarded by the CSc. degree (equivalent of a Ph.D. degree). Total number of supervisors within the Department, who are specialised in different fields of electrical engineering, is 12. The present number of full- and part-time Ph.D. students is 8. Four other teachers and one researcher from industry are writing and finishing their dissertation.

The research carried out at the Department of Electrical Drives, covers a broad field of interest. It is concentrated on CAD of electrical machines and apparatus, controlled electrical drives, power electronics converters with improved dynamic properties, applications of the latest knowledge of control theory to control of complex drive systems, multi-motor drives of manufacturing lines, industrial plants and robots. The control is based on microcomputer implementation of control algorithms.

The Department of Electrical Drives has intensive collaboration with industrial enterprises and universities in Slovakia and many contacts with universities abroad. The details of all presented activities are given below.

3. Structure of the Department

At present the total number of staff members is 41; among them 31 full academic staff, 4 researchers and 6 supporting and technical staff. Internally the department is divided into 5 divisions:

1. Division of Electrical Drives
2. Division of Power Electronics
3. Division of Electrical Machines and Apparatus
4. Division of Automation of Electrical Equipment
5. Division of General Electrical Engineering
   (This division is responsible for education of subjects from electrical engineering on other faculties within the Technical University)

An overview over staff members competence into division is given in the table.

4. Educational Activities

The Department of Electrical Drives is responsible for education in the field of electrical engineering. Two types of undergraduate courses leading to Bachelor degree (Bc.) and Master's one (Ing.) and postgraduate course leading to the Dr. Degree are offered.

4.1 Bachelor's Degree (Bc.) Undergraduate Course

The new Electrical Engineering Course for Bachelor (Bc.) degree offers a wider specialisation (including business and management) with the aim to educate the students to meet industrial requirements. The course will start in academic year 1996/97. In the following, the short characteristic of the course is presented.

Education aims of the course are:

- to provide students with adequate knowledge of theoretical fundamentals (mathematics, physics and mechanics) as well as with wide basis of electrical engineering, power electronics, electrical drives and computer techniques with a stress to CAD and CAM systems,

Structure of the Department of Electrical Drives

Head of Department:	*Assoc. Prof. Jozef Fedor, Ph.D.*
Deputy Head of Department:	*Assoc. Prof. Viliam Fedák, Ph.D.*

Divisions:

Electrical Drives	Power Electronics	Electrical Machines and Apparatus
Assoc. Prof. Ján Fetyko, Ph.D.	*Assoc. Prof. Jozef Ondera, Ph.D.*	*Assoc. Prof. Michal Kostelný, Ph.D.*
Prof. Jaroslav Timko, Ph.D.	Assoc. Prof. Jaroslav Dudrík, Ph.D.	Assoc. Prof. Jozef Fedor, Ph.D.
Prof. Ladislav Zboray, Ph.D.	Assoc. Prof. Irena Kováčová, Ph.D.	Assist. Prof. Bartolomej Fedor, Ph.D.
Assoc. Prof. Viliam Fedák, Ph.D.	Assoc. Prof. Juraj Oetter, Ph.D.	Assist. Prof. Želmíra Ferková, Ph.D.
Assoc. Prof. Jaroslav Tomko, Ph.D.	Assoc. Prof. Imrich Pokorný, Ph.D.	Assist. Prof. Ján Kaňuch
Assist. Prof. František Durovský, Ph.D.	Peter Višnyi, Ph.D. - research worker	Assist. Prof. Pavel Záskalický, Ph.D.
Assist. Prof. Marcela Halušková, Ph.D.	Pavel Pokrivčák - Ph.D. student	
Róbert Šándor - research worker	Rastislav Uhrín - Ph.D. student	
Le Quang Duc - Ph.D. student		

Automation of Electrical Equipment	General and Applied El. Engineering	Supported and Technical Staff
Assoc. Prof. Pavol Fedor, Ph.D.	*Assist. Prof. Stanislav Kovalčin, Ph.D.*	Veronika Majerníková - secretary
Assoc. Prof. Michal Girman, Ph.D.	Assist. Prof. Eva Dobošová	Katarína Gočová - technician
Assist. Prof. Peter Bober, Ph.D.	Assist. Prof. Vladislav Maxim	Ing. Vasil Graban - technician
Assist. Prof. Stanislav Fedor	Assist. Prof. Dionýz Milly, Ph.D.	Ivana Timárová - technician
Assist. Prof. Juraj Haluška, Ph.D.	Assist. Prof. Juraj Németh - depart. secr.	Anton Nagy - technician
Assist. Prof. Daniela Perduková, Ph.D.	Assist. Prof. Vladimír Kolcun	
Rastislav Harčarufka - research worker	Assist. Prof. Miroslav Tvrdoň	
Peter Koščo Ph.D. - research worker	Assist. Prof. Jaroslava Žilková	
Gabriela Brečková - technician		
Ján Skonc - Ph.D. student		
Do Quoc Vu - Ph.D. student		

- to develop practical skills to design circuits and systems and in failure diagnostic, mainly in power semiconductor converters, motors and controlling systems of the drives,
- to provide students with knowledge of economics and business.

During study period there are two practices (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 Bachelor's Degree (Bc.) Undergraduate Course Programme

First Year

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

Subject	1st Sem. Lect./Lab.	2nd Sem. Lect./Lab.	Hours total
Fundamentals of Electrical Engineering	2/1 ex		42
Mathematics I, II	4/4 ex	3/3 ex	196
Computers and Programming	2/2 ex	0/2 ca	84
Technical Documentation	2/2 ca		56
El. Engineering and Measurement I, II	3/3 ex	3/3 ex	168
Electronics		4/3 ex	98
Physics		2/2 ex	56
Total:	13/12	12/13	700
Foreign Languages:	0/2 ca	0/2 ca	
EA I in duration of		4 weeks	

Abbreviations: ex = exam, ca = continuing assessment

Second Year

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

Subject	3rd Sem. Lect./Lab.	4th Sem. Lect./Lab.	Hours total
Economics	0/2 ca	0/2 ca	56
Electrical Machines and Apparatus I, II	4/3 ex	3/3	182
Power Electronics I, II	3/4 ex	2/3 ex	168
Microprocessor Techniques	2/2 ex		56
Computers in Electrical Engineering I, II	2/4 ex	2/3 ex	154
Electrical Drives	-	4/4 ex	112
Total:	11/15	11/15	728
EA II in duration of		6 weeks	

Third Year

Duration: 14 + 14 weeks

Subject	5th Sem. Lect./Lab.	6th Sem. Lect./Lab.	Hours total
Business and Management Studies	0/2 ca	0/2 ex	56
Power Engineering I, II	2/2 ex	3/1 ex	112
Project	0/7 ca		98
a) Automatic Control of Drives I, II	3/3 ex	3/4 ex	182
b) Power Semiconductor Systems I, II	3/3 ex	3/4 ex	182
c) Electrical Drives Design	2/2 ex		56
c) Industrial Drives	2/2 ex		56
c) Control Systems	2/2 ex		56
c) Robots and Manipulators	2/2 ex		56
c) Control of Quality and Reliability	2/2 ex		56
Total:	9/11	6/14	560

*) Option: student chooses one subject from *a*), *b*) and two subjects from group *c*)

4.2 Master's Degree (Ing.) Undergraduate Course

The course covers five years of study. In the first two years of study a wider basic knowledge of engineering is given to students at other departments of faculty and university. Since the third year of study when students are taught under the supervision of the Department, the students are specialised according to their interest by choosing the optional subjects. In such way they approach more or less to one from the following lines of study (according to the chosen subjects):

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 and thus they receive a broader field of knowledge. .

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

Within the framework of this branch of study 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 by electrical drives and power electronic converters applications.

Overview of the Master's Degree (Ing.) Undergraduate Course Programme

Third Year

Duration: 14 + 14 weeks

Option Subject	5th Sem. Lect./Lab.	6th Sem. Lect./Lab.	N° of credits	Lecturer
Compulsory Subjects				
Social Sciences	0/2 ca		2	
Theory of Control	2/2 ex		5	Bučko
Applied Electronics	3/3 ex		7	Oetter
Electrical Machines I.	3/3 ex		7	Kostelný

Optional Subjects (student choose min. 2 subjects)			
Superconductivity and Ferromagnetism	3/1 ex	4	Dudáš
Control Systems Software	2/2 ex	4	Girman
Mechanics	2/2 ex	4	Jurica
Electrical Heating and Light Techniques	2/2 ex	4	Novák
Model. and Measur. of Control Circuits	1/3 ex	4	Kováčová
Applied Mathematics	2/2 ex	4	Pirč
Compulsory Subjects			
Power Electronics I.	3/3 ex	7	Dudrík
Automation of Electrical Equipment I.	2/3 ex	6	Girman
Electrical Apparatus	3/2 ex	6	Fedor J.
Optional Subjects (student choose min. 2 subjects)			
Interfaces of Controlling Systems	3/3 ex	7	Haluška
Electrical Machines II.	3/3 ex	7	Kostelný
Components of Digital Control Systems	2/2 ex	5	Haluška
Electromechanical Systems	2/2 ex	5	Fedák Fetyko
Optional Subject from the Faculty List	ex		
Required number of credits		60	

Fourth Year

Duration: 14 + 14 weeks

Option Subject	5th Sem. Lect./Lab.	6th Sem. Lect./Lab.	N° of credits	Lecturer
Compulsory Subjects				
Electrical Drives	3/3 ex		7	Timko
Power Engineering I.	3/3 ex		7	Chladný
Optional Subjects (student choose min. 3 subjects)				
State Control of Electrical Drives	2/3 ex		6	Zboray
Control Systems Construction	2/3 ex		6	Haluška
Production Systems Identification	2/3 ex		6	Fedák
Control Circuits for Power Electronics	2/3 ex		6	Oetter
Computer Aided Design	2/3 ex		6	Kovalčin
Electrical Machines Design	3/2 ex		6	Ferková
Modelling of Converters	1/3 ex		5	Kováčová
Parts and Systems of Mechanisms	2/2 ex		4	
Optional Subject from the Faculty List	ex			

Compulsory Subjects			
Economic - Jurist Sciences I.	0/2 ca	2	
Controlled Drives	3/3 ex	7	Zboray
Automation of Electrical Equipment II.	3/3 ex	7	Fedor P.
Optional Subjects (student choose min. 3 subjects)			
Electrical Apparatus Design	2/3 ex	6	Fedor J.
Electrical Drives Design	2/3 ex	6	Pokorný
Complex Drive Systems	2/3 ex	6	Fedák
Power Semiconductor Converters II.	3/3 ex	6	Ondera
Power Engineering II.	3/2 ex	6	Kolcun
Computer Aided Design	0/4 ca	2	Fedor S.
Controlling Electronic Circuits	0/4 ex	2	Fedor S.
Power Electronics Laboratory Practice	0/2 ca	2	
Required number of credits		60	

Fifth Year

Duration: 14 + 10 weeks

Option Subject	5th Sem. Lect./Lab.	6th Sem. Lect./Lab.	N° of credits	Lecturer
Compulsory Subjects				
Economic - Jurist Sciences II.	0/2 ca		2	
Master Thesis Seminar	0/5 ca		5	
Optional Subjects (student choose min. 4 subjects)				
Special El. Machines and Apparatus	3/2 ex		6	Kostelný, Fedor J.
Semiconductor Converters Applications	2/3 ex		6	Ondera
Converters Design and Construction	2/3 ex		6	Pokorný
Control of Robots and Manipulators	2/3 ex		6	Fetyko
Control Systems of Technological Plants	2/3 ex		6	Girman
Industrial Drives	2/3 ex		6	Tomko
High-Voltage Technique	2/3 ex		5	Marton
Electrical Equipment Construction	2/2 ex		5	Fedor S.
Microcomputer Control of Converters	2/2 ex		5	Višnyi
Optional Subject from the Faculty List	ex			
Master Thesis (Diploma Work)		x		
Required number of credits			30	

The Department of Electrical Drives ensures the teaching of specialised subjects in other lines of study within the FEI and it is also responsible for teaching of subjects dealing with electrical engineering fundamentals at other faculties of the TUKE. The specialised subjects are:

Electrical Engineering Fundamentals (for different faculties), Apparatus and Equipment, Electrical Apparatus for Working Machines, Special Electrical Drives, Spreadsheets and Databases, Electronic Elements, Drives and Power Electronics, Electrical Equipment for Machines in Food Industry, Editors.

4.3 Doctor's Degree (Dr.) Postgraduate Course

Students with a Master's Degree (Ing.) can apply for a postgraduate course lasting four years. The postgraduate program is divided into two parts. In the first two years, deep knowledge of the branch followed is given. The work in the third and fourth year of study is concentrated on research. The course is finished by defence of the dissertation.

Overview of the Doctor's Degree (Dr.) Postgraduate Course Programme

First Year

Specialisation: Electrical Drives, Power Electronics, Electrical Machines and Apparatus

Subject	Hours per year	Lecturer
Mathematics	90 ex	Moravský,
* Mathematics	60 ex	Pirč, Petruška
* Physics of Magnetic Phenomena	30 ex	Zagyi, Ziman
Theoretical Basis of the Specialisation	60 ex	supervisor
Foreign Language	30 ex	
Total:	210 hours	
Number of examinations	3 (4*)	

* for Electrical Machines and Apparatus specialisation only

Second Year

Subject	Hours per year	Lecturer
Subject of Specialisation	30 ex	supervisor
* Electrical Machines and Apparatus	30 ex	Kostelný, Fedor J.
* Power Electronics	30 ex	Pokorný, Dudrík
* Computers Application in El. Engineering	30 ex	Girman, Višnyi, Haluška
* Controlled Drives	30 ex	Zboray, Tomko
* Complex Drive Systems Control	30 ex	Fedák
* Servomechanisms in Robotics	30 ex	Fetyko
* Electronics	30 ex	Oetter, Haluška
* Control Theory	30 ex	Krokavec D.
Foreign Language II. (individual preparation)		
Total:	120 hours	
Number of examinations	5	

* Students choose three from optional subjects based on the supervisor recommendation and according to the theme of thesis.

5. Current Research Projects

Scientific research is carried out in collaboration with national authorities and industry. The research covers all branches followed by the department:

Projects with industry are described at the end of this brochure. Following current research projects are carried out at the Department:

1. State Control Design of Electrical Drives
2. Control of Drives for Vibration Equipment
3. Special Electrical Drives of Low Power Rating
4. Software and Hardware Development of Distributed Control Systems for Multi-Motor Drives and Complex Drive Systems
5. Advanced Control Methods in Industrial Automation
6. Power Semiconductor Converters with Low Power Losses

1. State Control Design of Electrical Drives

Supported by grant N° 9413 of the Grant Agency for Science.
Duration: 1993 - 1995
Leader: Ladislav Zboray
Members: František Ďurovský, Viliam Fedák, Ján Fetyko

Goal of the project:

Design of the state-space control of basic types of DC and AC drives.

Research activity of the group is concentrated on:

- state-space control design for non-linear systems,
- non-linear observers design for DC and AC drives,
- control of the two-mass drive system with elastic coupling,
- state control of robot servosystems,
- state control of multi-motor drive.

Results achieved in 1995:

- derivation of a new variant of the singular perturbation method for cascade control structure and its application for system order reduction,
- state control of servodrives of a robot,
- applications of the state control to industrial drives,
- summarisation of the research objectives into a monograph „State Control of Electrical Drives".

Publications in 1995 (see chapter 6):
[B1], [B2], [J2], [C2], [C3], [C4], [C8], [C9], [C27]

2. Control of Drives for Vibration Machines

Supported by grant N° 2323/95 of the Grant Agency for Science.
Duration: 1995 - 1997
Leader: Jaroslav Tomko
Members: Jozef Fedor, Želmíra Ferková, Vladislav Maxim, Dionýz Milly, Juraj Oetter (33 %), Róbert Šándor
Ph.D. student: Le Quang Duc

Goal of the project:

To find a suitable drive for various applications of vibration machines and to design suitable control circuit for it.

Research activity of the group is concentrated on:

- design of switched reluctance motor of rating power 3 kW and nominal revolutions 3000 rev./min.
- choice of a commercially produced converter with possibility of its adjusting for supplying of the SRM,
- design and adjusting of the position sensor of the rotor of SRM,
- design and production of trajectory sensor of vibration movement,
- mathematical model of the vibration machine,
- design and verification of the control structure in order to check possibilities to change a trajectory of a vibration movement.

Results achieved in 1995:

- derivation of a non-linear mathematical model of a vibration mill, its simulation and verification by measuring on the laboratory equipment,
- calculation of magnetic flux of SRM using the finite-elements method and taking into consideration the motor construction,
- investigation of the SRM from the view of point of possibility to change in the trajectory of movement of the vibration machine,
- modifications in the programme PSPice and its utilisation for simulation of dynamic phenomena in electro-magnetic circuits of the system converter - SRM,
- analysis of frequency converters from the point of view of its utilisation in the system asynchronous motor drive - vibration machine,
- utilisation of the PSPice programme to design power elements of the SRM drive.

Publications in 1995 (see chapter 6):
[B1], [C7], [C18], [C19], [C24], [C25], [D5]

3. Special Electrical Drives of Low Power Ratings

Research project N° 41152 based on institutional granting.
Leader: Juraj Oetter
Members: Bartolomej Fedor, Ján Kaňuch, Michal Kostelný, Miroslav Tvrdoň, Pavel Záskalický

Goal of the project:

To design and investigate properties some from new types of motors.

Research activity of the group is concentrated on:

- development and realisation of the switched reluctance motor (SRM) with axial air gap,
- development and design of a step motor with axial air gap and small step,
- optimisation of the design based on monitoring of magnetic fields.

Results achieved in 1995:

- investigation of magnetic field in the air gap of the switched reluctance motor with axial air gap using method of finite elements,
- parametric measurements of the inductance of phase winding of the motor with axial air gap were realised,
- theoretical analysis of winding inductance for different types SRM with axial air gap were performed,
- designed sensor of the position of rotor of SRM with optoelectronic elements of common production,

Publications in 1995 (see chapter 6):
[J1], [J2], [J4], [C26], [D3]

4. Software and Hardware Development of Distributed Control Systems for Multi-Motor Drives and Complex Drives Systems

Research project No 41 151 based on institutional granting (in 1995 the two sub-projects numbered here by N° 5 and 6 were also incorporated in this project.)
Leader: Michal Girman
Members: Peter Bober, Pavol Fedor, Stanislav Fedor, Juraj Haluška, Rastislav Harčarufka, Peter Košč, Daniela Perduková
Ph.D. students: Do Quoc Vu, Ján Skonc

The project deals with two basic topics:
1. 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.

Results achieved in 1995:

- realised model of HW for a transputer node,
- methodology derivation to define virtual connection in a transputer net,
- derivation of methodology to design controllers for multi-motor drive systems with elastic coupling.

Publications in 1995 (see chapter 6):
[C1], [C6], [C10], [C11], [C20], [V21], [D2], [C12], [C13], [C14]

5. Advanced Control Methods in Industrial Automation

In 1995 as a sub-project of the project N° 4.
Duration: 1995 (preparation phase) - 1997
Leader: Jaroslav Timko
Members: Eva Dobošová, Marcela Halušková, Irena Kováčová (66 %), Jaroslava Žilková

Goal of the project:

To adapt the modern control methods (fuzzy controllers, neural networks, adaptive controllers and controllers with variable structure) to industrial drives.

Research activity of the group is concentrated on:

- simulation of power semiconductor switching devices,
- applications of neural networks in control of electrical drives,
- control of electrical drives using method of variable structures,
- direct control of AC drives.

Results achieved in 1995:

- simulation models of MOSFET and IGBT in programmes TINA and PSPice,
- control of AC drives by method of variable structures,
- application of variable structures method to control two-motor drive,
- state control of the drive with the linear asynchronous motor.

Publications in 1995 (see chapter 6):
[C15], [C16], [C17], [C21], [C22], [C23], [D1], [D4]

6. Power Semiconductor Converters with Low Power Losses

In 1995 as a sub-project of the project N° 4.
Duration: 1995 (preparation phase) - 1997
Leader: Jaroslav Dudrík
Members: Stanislav Kovalčin, Jozef Ondera, Imrich Pokorný, Peter Vyšnyi

Goal of the project:

To develop, investigate and verify connection of converters for various converter 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,
- development of models of indirect DC converters,
- design and realisation of a laboratory connection of a DC converter with a possibility to modify various connections and control algorithms.

Results achieved in 1995:

- analysis of the resonant link for a frequency converter and verification of its performance,
- modelling of some types of indirect frequency converters in a simulation programme PSPice,
- construction of the power part for the indirect DC converter with IGBT.

Publications in 1995 (see chapter 6): [C4], [C6]

6. Publications in 1995

1. Books, Monographs and Textbooks

[B1] Milly, D. - Ďurovský, F.: Power Electronics and Electrical Drives. Teaching material for the course on Electrical Drives for Industrial Plants. ETC VSŽ Ltd., Košice, 1995, 48 p. (in Slovak)

[B2] Zboray, L. - Ďurovský, F.: State Control of Electrical Drives. Vienala, Publishing Company, Košice, 1995, 190 p. (in Slovak)

2. Journal Papers

[J1] Sargos, F.M. - Záskalický, P. - Gudelfin, E.J.: Structures Theory of Reluctance Step Motors. IEEE Industry Applications Magazine, May/June 1995, pp. 28 - 32

[J2] Čverčko, J. - Fedák, V. - Fetyko, J. - Varga, J.: Loop and Tension Control in Hot-strip Tandem Mill. Steel Sheets, vol. 21, No 2-3/1994, pp. 43-46 (in Slovak)

[J3] Sargos, F.M. - Gudelfin, E.J. - Záskalický, P.: Etude analytique du foncionnement des moteurs á réluctance alimentés á fréquence variable. J. Phys. III France, 5 (1995), p. 339-354

[J4] Sargos, F. M. - Záskalický, P. - Gudelfin, E. J.: Théorie généralisée des structures des machines á réluctance: machine á stator dissymétrique. RGE, N° 3, 1995, pp. 1-5

3. Conference Papers

[C1] Bober P. - Fedor, P. - Girman, M. - Harčarufka, R.: Increase of the Parallel Simulation System Power by Number of Elements. In: Conf. Proc. „Computer Science", Ostrava, Sept. 5-7, pp. 145-150 (in Slovak)

[C2] Ďurovský F.: Nonlinear State Control of a DC Motor. In: Proc. of the Int. microCAD'95 Conf., Miskolc 1995, section E, pp. 47-51

[C3] Čverčko, J. - Varga, J. - Fetyko, J. - Fedák, V.: Loop and Tension Control in the Hot-Strip Tandem Mill. In: Proc. of the VSŽ Conf. „Rolling of the the Hot Strips", Stará Lesná, 20.-22 Nov. 1995, s.45, 1-4

[C4] Dudrík, J. - Kinlovič J.: A Source with IGBT for Welding. In: Proc. from the Int. Symposium „Aplikovaná elektronika", Plzeň, Feb. 1-3, 1995, pp. 81-84

[C5] Fedák V.: Comparison of Control Algorithms for Complex Drive Systems utilizing the MIMO Systems Theory. In: Proc. of the Int. microCAD'95 Conf., Miskolc 1995, section E, pp. 12-16

[C6] Fedor, P.: Utilization of the 2nd Lyapunov Method in Controlled Electrical Drives. In.: Proc. of Int. Conf., Ostrava, 1995,, session 23, pp. 109-113 (in Slovak)

[C7] Ferková, Ž.: Selection of Air Gap and Depth of Rotor Groove of Switched Reluctance Motors. In.: Proc. Int. Workshop on Electrical Machines in Prague, Sept. 6-7, 1995, pp. 48-53

[C8] Fetyko, J.: Electrical Servodrives of Robots with State Space Control. In: Proc. of the Int. microCAD'95 Conf., Miskolc 1995, section E, pp. 6-11

[C9] Fetyko, J. - Čverčko, J. - Fedák, V. - Varga, J.: Non-Linear State-Space Tension Control for Hot-Strip Finishing Mill. In: Proc. of the Conf. „Hutnicze Napedy Elektryczne", Czestochowa, Oct. 12-13, 1995, pp.69-75

[C10] Haluška, J.: Computer Control of RTG Powder Difraktometer. In: Proc. Of the „Regionálna prášková difrakčná konferencia" , RPDK'95, Sept. 20-22, 1995, p.13. (in Slovak)

[C11] Haluška, J. - Harčarufka, R. - Timko, J.: Monitoring and Controling Radio Computer Network. In.: Proc. of Int. Scientific Conf. ELEKTRO'95, Žilina, Feb. 7-8, 1995, pp. 25 -28 (in Slovak)

[C12] Košč, P: Position/Speed Fuzzy Logic Controllers for Torque Controlled Electrical Drives. In: Proc. of the Int. microCAD'95 Conf., Miskolc 1995, section E, pp. 34-38

[C13] Košč, P.: New Identification Method of Electrical Drives in State-Space. In: Proc. of the Int. microCAD'95 Conf., Miskolc 1995, section E, pp. 39-42

[C14] Košč, P. - Griva, G. - Profumo, F.: Self-Tuning Position/Speed Fuzzy Logic Controllers for Torque Controlled Drives. In: Proc. of IPEC, Yokohama'95, pp. 1758 - 1765

[C15] Kováčová, I.: Switching Simulation Models of Power MOSFET and IGBT. In: Proc. Int. Conf., Ostrava, 1995, session 23, pp. 191-196

[C16] Kováčová, I.: Modelling of Converters in PSPice Program. In: Proc. of 2nd Int. Conf. AMTEE, Plzeň, 1995, pp. 205-211 (in Slovak)

[C17] Kováčová, I. - Šimko, V.: Some results from Solution of Circuits with Electronic Elements using Program TINA. In.: Proc. of Int.Conf., Ostrava, 1995, pp. 100-103

[C18] Maxim, V. - Milly, D.: Pspice for Modeling of a Switched Reluctance Motor. In: Proc. of SEKEL'95, VUT Brno, Feb. 95, pp. 83-86 (in Slovak)

[C19] Milly D. - Maxim V.: Simulation of Switched Reluctance Motor using PSPice. In: Proc. of the Int. microCAD'95 Conf., Miskolc 1995, section E, pp. 43-46

[C20] Perduková, D. - Fedor, P.: Control of Continuous Line with an Incomplete Access to State Variables. In: Proc. of the Conf. „Hutnicze Napedy Elektryczne", Czestochowa, Oct. 12-13, 1995, pp.60-68

[C21] Timko, J. - Halušková, M. - Haluška, J.: Variable Structure Position Control in Parallel Structure. In: Proc EPE'95 Conf., Sevilla, Sept. 19-21, 1995, pp. 3.436-3.439

[C22] Timko, J. - Ondrej, M. - Halušková, M.: Application of Sliding Modes to Double-Motor Control. In: Proc. from IFAC Symposium on Motion Control, München, Oct. 9-11, 1995, pp. 501-507

[C23] Timko, J. - Žilková J.: State Space Control Design for Linear Induction Motor Drive. In: Proc. of the Int. microCAD'95 Conf., Miskolc 1995, section E, pp. 25-28

[C24] Tomko, J. - Ferková, Ž. - Šándor, R.: Dynamic Model of a Vibration Mill System Driven by Switched Reluctance Motor. In: Proc. of the Int. microCAD '95 Conf., Miskolc 1995, section E, pp. 17-24

[C25] Tomko, J. - Milly, D. - Ďurovský, F. - Maxim, V.: Design of a Drive with Asynchronous Motor for Roller Table of Hot-Strip Mill. In: Proc. of the Conf. „Hutnicze Napedy Elektryczne", Czestochowa, Oct. 12-13, 1995, pp.50-59 (in Slovak)

[C26] Záskalický, P.: Analytical Optimisation of the Torque of Battery-Fed Switched Reluctance Motors. In.: Proc. of Int. Conf., Ostrava, 1995, session 23, p. 149-154

[C27] Zboray, L.: Nonlinear Control Methods Applied in Electrical Drives. In: Proc. of Int. Conf. ELEKTRO'95, Žilina, 1995, pp. 137-143

4. Dissertations

Defended:

[D1] Dobošová, E.: Magnetfeldberechnung mit nicht-orthogonalen Potential-funktionen. Diplomová práca, WS 94/95, ETH Zurich, 1995, 53 s

[D2] Fedor, P.: Utilisation of the 2nd Lyapunow Method in Electrical Drives. Habilitation work, FEI TU, FEI TU, Košice, 1995, 60 p. + 60 p. encl.

[D3] Kolcun, V.: Switched Reluctance Motor with Axial Air-Gap. Rigorous work, FEI TU, FEI TU, Košice, 1995, 84 p.
supervisor: Kostelný

[D4] Žilková, J.: Possibilities of Application of Neural Networks to Identify and Control of Electrical Drives. Rigorous work, FEI TU v Košice, 1995, 47 p. supervisor: Prof. Timko

Prior the defension:

[D5] Maxim, V.: Analysis of the Steady and Transient States in the Power Semiconductor Converter of SRM. Dissertation, FEI TU, Košice, 1995 supervisor: Oetter J.

[D6] Uhrín, R.: Conversion System with Parallel Resonant DC Link. Dissertation, FEI TU, Košice, 1995, 129 pp. supervisor: Pokorný

5. Other Publications, Reports and Patents

[O1] Kováč, D. - Kováčová, I.: Connection for a Tolerance Control of the Three-Phase Voltage Inverter. Patent Application N° 0977-95 (in Slovak)

[O2] Kováč, D. - Kováčová, I Connection of a Three-Phase Rectifier with Diodes and Transistor. Patent N° 277 993, 1995 (in Slovak)

[O3] Timko, J. - Fedor, P. - Kováč, D.: Influence of Higher Harmonics for the Precision of the Measurement Transformers. Report for VSE Kosice, (East Slovak Power Plant). FEI TU Košice, 1995, 54 p. (in Slovak)

[O4] Tomko, J - Milly, D. - Maxim, V. - Ďurovský, F.: Elaborating of the Damages Analysis of TIR Converters at the Hot-Strip Finishing Mill TŠR-1700 in VSŽ Košice at Supply Voltage Interruptions. Report N° ZOD 10/0415/95 for VSŽ Košice). FEI TU Košice, Dec. 1995, 27 p. (in Slovak)

[O5] Fedor, J. - Jurica, V. - Fedor, B. - Kaňuch, J. - Tvrdoň, M. - Kolcun, V.: Development of a Compact Three-Phase Motor Starter. Report for SEZ, a.s. Krompachy). FEI TU Košice 21 p. (in Slovak)

7. Students Works in 1994/95

7.1 Graduate Theses (Diploma Works)

1. Power Electronics

1. Ambriško, J.: Converter for Arc Welding
   Adviser: Dudrík
2. Bajus, M.: Desing and Realization of Working-Place for the Subject „Measurement and Modeling of Controlling Circuits"
   Adviser: Kováčová
3. Boroš, P.: Design and Realisation of Generators for Control of Voltage Inverter
   Adviser: Kováčová
4. Czuczor, I.: Testing Equipment with a Single-Chip Microprocessor
   Adviser: Kovalčin
5. Debnár, J.: Universal Laboratory Impulse Converter
   Adviser: Ondera
6. Gábor, R.: DC Converter with the Switchin-off at Zero Current
   Adviser: Dudrík
7. Gáfrik, D.: Possibilities of Light Sources Supply by Converters
   Adviser: Ondera
8. Hežélová, G.: Universal Impulse Generator for Control of a Net Converters
   Adviser: Oetter
9. Janíčko, A.: Design of a DC Current Source
   Adviser: Dudrík
10. Kachman, J.: DC Digital Drive of a Low Power Supplied from an Accumulator
    Adviser: Kováčová
11. Kulík, L.: Theoretical Design of an Electronic Wattmeter for Measurement of the Switch-off Loses of Power Semiconductor Devices
    Adviser: Kováč
12. Pokorný, M.: Programable Registration Equipment
    Adviser: Kovalčin
13. Polák, D.: Design of Universal Module of Rectifiers for Laboratory
    Adviser: Ondera
14. Vida, Š.: Transistor Frequency Converter with a Circuit Currents
    Adviser.: Pokorný

2. Electrical Drives

1. Dermek,D.: Adaptive Control of a DC Drive
   Adviser:Tomko

13. Farbula, M.: DC Drive with the Converter SIMOREG K
Adviser: Zboray
14. Hajnala, P.: Two-Zone Speed Control
Adviser: Tomko
15. Kudlej, P.: Servodrives for an Educational Robot MA 2000
Adviser: Fetyko
16. Lučanský, J.: Model of the System: Frequency Converter - Asynchronous Motor
Adviser: Zboray
17. Mati, M.: Drive with a Linear Motor
Adviser: Timko
18. Pánči, P.: Crane Trolley Drive Control
Adviser: Zboray
19. Pilát Ľ.: Control of Electric Drive using the Variable Structures Method
Adviser: Timko
20. Podbrežný, J.: Control of a Synchronous Motor
Adviser: Zboray
21. Širocký, V.: Drive for a Raise Machine for Flue Ash with an Electrofilm
Adviser: Tomko
22. Záhoranský, R.: State-Space Control of a DC Drive
Adviser: Zboray

3. Electrical Machines and Apparatus

1. Balog, M.: One-Pole Circuit Breaker till 1000 A
Adviser: Fedor, J.
2. Bobaľa, Ľ.: Design of a Motoric Starter 1 A
Adviser: Fedor, J.
3. Dubecký, M.: Design of a Motoric Starter 16 A
Adviser: Fedor, J.
4. Ferčák, R.: Design of a Motoric Starter 10 A
Adviser: Fedor, J.
5. Gonda, R.: Design of a Library for Parts of an Asynchronous motor in AutoCAD
Adviser: Kostelný
6. Hábera, R.: Design of AC Three-Phase Windings using PC
Adviser: Kostelný
7. Hisira, M.: Exchange of a Stator Winding of an Hydrogenerator
Adviser: Kostelný
8. Kark, J.: Analysis Methods of Magnetic Fields of Switched Reluctance Motor
Adviser: Kostelný
9. Magyar, M.: High-Voltage Transformer without any Partial Discharge
• Adviser: Kostelný

Minkanič, A.: Measurement Methods of Loses Division for One-Phase Asynchronous Motors
Adviser: Kostelný
2. Poloha, M.: Optimization of Magnetic Circuit of a Switched Reluctance Motor with an Axial Air-Gap
Adviser: Kostelný
3. Roman, J.: Design of a Library for Parts of a Step Motor in AutoCAD
Adviser: Kostelný
4. Róthová, A.: Design of a Motoric Starter 32 A and 25 A
Adviser: Fedor, J.
5. Sedlák, R.: Linear Switched Reluctance Motor
Adviser: Kostelný
6. Štofirová E.: Design of a Motoric Starter 0,2 A and 0,24 A
Adviser: Fedor, J.
7. Vaško, M.: Magnetic Field of a Step Motor with an Axial Air Gap
Adviser: Kostelný

4. Automation of Electrical Equipment

Balara, A.: Control of a Three-Masses System with Elastic Couplings and Backlash
Adviser: Fedor, P.
1. Briatková, V.: Identification of the Drive Complexes by Statistic Methods
Adviser: Fedák
2. Herman, K.: Assembly of the Development System to Control 3-Phase Frequencey Converter by the processor Inter 196
3. Adviser: Fedor, P.
4. Hreha, M.: Dseign of PI Controllers for MIMO Systems
Adviser: Fedák
5. Kolarčík, V.: Modul for the PC to Connect Incremental Encoders of the IRC Type
Adviser: Haluška
6. Miško, R.: Utilization of the MATLAB/SIMULINK Programme for Simulation od Drive Complexes
Adviser: Fedák
7. Mitterpach, I.: Supermimposed Monitoring System for Connection of Several Subordinated Systems
Adviser: Haluška
8. Nagyidai, E.: Library for Vizualisation under System OMOS
Adviser: Fedor, P.
9. Pavlov, E. Control of Drive for the Washing Line
Adviser: Griman
10. Pilcha, D.: Control of the Line for Powder Coating of Bituminous Mixtures
Adviser: Fedor, P.
11. Regenda, M.: Drawing of Technical Documents
Adviser: Girman
12. Svitek, J.: SW for Transputer Designed for Logical Control
• Adviser: Girman

1. Števek, D.: Control of Drives for Perlit Production Line
   Adviser: Girman
2. Tóth, D.: Design of a Fuzzy Controller without Necessity of the Output Variable Derivative Adviser: Fedor, P.
3. Uchnár, L.: Design of a DC Drive using Transputer System
   Adviser: Fedor, P.
4. Vaľko, L.: Control of a Transport Node
   Adviser: Girman
5. Vaľko, M.: Design of a Communication Transputer Circuit of the Type C011 by the Circuit of the Type PLD Adviser: Haluška
6. Zagata, D.: Superimposed Control of the Dividing Line N° 9 in the VSŽ Company Adviser: Haluška

7.2 Students' Scientific Reports

Within the International Students' Scientific Conference held in Bratislava on 21-22 June. The Conference was supported by The Foundation of Academic Ladislav Cigánek. Four students' reports from the Department were presented there. The contributions were published in the Proceedings „Electrical Engineering'95 Conference", STU Bratislava, 1995:

1. Háber R.: Design of AC Windings using Computer PC/AT
   pp. 13 - 23 Vedúci: Ferková
2. Herman, K.: Assembly of the Development System for Control of a Three-Phase Frequency Converter based on the Processor INTEL 196
   pp. 95 - 105 Vedúci: Fedor, P.
3. Pánči, P.: Crane Trolley Drive Control
   pp. 133-139 Vedúci: Zboray
4. Zahoranský, R.: State Control of DC Drive
   pp. 157 -163 Vedúci: Zboray

8. Information about Staff Members

Fields of Research Interests of Teaching Staff Members

Jaroslav Timko, Professor, Ph.D.
Control of AC drives (also linear ones) fed by power electronic frequency converters. Applications of neural networks in electrical drives.

Ladislav Zboray, Professor, Ph.D.
Non-linear state control methods and their application to the control design of drive systems.

Jaroslav Dudrík, Associate Professor, Ph.D.
Analysis, design and control of static power converters, high-frequency resonant and soft switching in DC/DC converters.

Viliam Fedák, Associate Professor, Ph.D.
Application of the advanced control theories for control of single- and multi-motor drives, systems identification and modelling of drive systems.

Jozef Fedor, Associate Professor, Ph.D.
Switching electrical circuits and switching apparatus, applications of power semiconductor devices and circuits for a switching techniques.

Pavol Fedor, Associate Professor, Ph.D.
Software for control and new control methods of electrical drives, parallel and distributed programming and application software for transputer system.

Ján Fetyko, Associate Professor, Ph.D.
Control of electrical drives. Electric servosystems for robots. Non-adaptive and adaptive control of industrial robots.

Michal Girman, Associate Professor, Ph.D.
Software for automation and control systems, parallel and distributed programming-multitasking on PC&LAN and software for transputer systems.

Michal Kostelný, Associate Professor, Ph.D.
Design of electrical machines, esp. switched reluctance motors of various types (with radial and axial air-gap).

Irena Kováčová, Associate Professor, Ph.D.
Modern power semiconductor switching devices (MOSFET, IGBT, PIN diodes), and their application in power converters.

Juraj Oetter, Associate Professor, Ph.D.
New types of power semiconductor converters and their control, microcomputer controlled transistor converters for SRM.

Jozef Ondera, Associate Professor, Ph.D.
Design and control of power semiconductor converters, design of direct-current converter. Applications of converters for illuminating engineering and battery chargers.

Imrich Pokorný, Associate Professor, Ph.D.
Inverters with and without DC line, design of resonant inverters, back influence on supplying lines and higher harmonics elimination in output voltages and currents.

Jaroslav Tomko, Associate Professor, Ph.D.
Modern methods of electrical drives control. Adaptive systems with time delay. Electrical drives for technological lines and vibration machines.

Peter Bober, Assistant Professor, Ph.D.
Parallel programming and simulation, hierarchical and distributed control systems for technological processes.

Eva Dobošová, Assistant Professor
Analytical investigations of magnetic fields in the air-gap of electric machines.

František Ďurovský, Assistant Professor, Ph.D.
Control of electric drives, esp. state-space control. Design of non-linear observers. Design and debugging of programs for digital control of electrical drives.

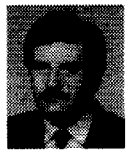
Bartolomej Fedor, Assistant Professor, Ph.D.
Switching of electrical circuits, switching devices and equipment. Application of power semiconductor devices and circuits for switching techniques.

Stanislav Fedor, Assistant Professor
Computer control, surface-mounting and hybrid technologies, design of measuring instruments for testing and diagnostic of energetic devices.

Želmíra Ferková, Assistant Professor, Ph.D.
Magnetic fields in electrical machines, esp. in switched reluctance motors.

Juraj Haluška, Assistant Professor, Ph.D.
Digital control systems, above all the multi-processor systems. Reliability of control systems. Multimedia systems.

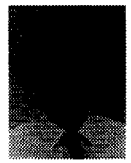
Marcela Halušková, Assistant Professor, Ph.D.
Variable structure systems, sliding mode operations, control of linear and non-linear systems which have applications in industrial drives problems. Multimedia systems.



Ján Kaňuch, Assistant Professor
Design of disk step motor and disk reluctance motor, also application of CAD methods in design of electrical machines and devices.

Vladimír Kolcun, Assistant Professor
Switched reluctance motors with axial magnetic field, CAD systems for electrical machines and apparatus.

Stanislav Kovalčin, Assistant Professor, Ph.D.
Design and control of power semiconductor converters using microcomputer techniques. Power electronics applications in industrial plants.



Vladislav Maxim, Assistant Professor
Analysis and simulation of power semiconductor converters for supply of switched reluctance motors.

Dionýz Milly, Assistant Professor, Ph.D.
Frequency converters with sinusoidal input and output currents. Control circuits for power converters. Power factor compensation. Switched sources.

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

Daniela Perduková, Assistant Professor, Ph.D.
Design methods and control structures for multi-motor drives. Model reference control systems.

Miroslav Tvrdoň, Assistant Professor
Switched reluctance motors with disc rotor. Magnetic fields solution using finite elements method.

Pavel Záskalický, Assistant Professor, Ph.D.
Structures of reluctance step motors. Linear theory of reluctance motors, optimisation of supply and power losses calculation.

Jaroslava Žilková, Assistant Professor
Applications of neural networks in electrical drives.

Fields of Research Interests of Research Workers

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

Peter Košč
Fuzzy logic control and neural networks applications in electrical drives, multimedia systems.

Róbert Šándor
Electrical drives, control electronics and automation technique.

Peter Višnyi
Digital speed and position control of electric machines, extremely high dynamic performance and precise electrical drives of small power.

Supported and Technical Staff

Gabriela Brečková, Ing.

technician

Katarína Gočová

economy

Vasiľ Graban, Ing.

technician

Veronika Majerníková

secretary

Anton Nagy

technician

Ivana Timárová

technician

9. Current Postgraduates in 1995/96

First Year

1. ***Le Quang Duc***, full-time Ph.D. student
   theme: Control of the Drive with SRM for a Vibration Mill
   supervisor: Jaroslav Tomko

Second Year

2. ***Ján Skonc,*** full-time Ph.D. student
   theme: Microcomputer Systems in Control of Electrical Drives
   supervisor: Michal Girman

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

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

Third Year

5. ***Robert Šándor***, Research worker
   theme: AC Drive of Vibration Mill
   supervisor: Jaroslav Tomko

Fourth Year

6. ***Do Quoc Vu,*** full-time Ph.D student
   theme: Fuzzy Control of Synchronous Motor Drive
   supervisor: Pavol Fedor

7. ***Kolcun Vladimír,*** Assistant Professor
   theme: Switched Reluctance Motor with Axial Air Gap - Construction and Measurement
   supervisor: Michal Kostelný

8. ***Jaroslav Žilková,*** Assistant Professor
   theme: Control of AC Drive by Neural Network
   supervisor: Jaroslav Timko

Further postgraduates (having finished their study and writing thesis)

1. ***Tvrdoň Miroslav,*** Assistant Professor
   theme: Switched Reluctance Motor with Axial Air Gap $2p_1/2p_2=6/4$
   supervisor: Michal Kostelný

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

3. ***Dobošová Eva,*** Assistant Professor
   theme: Phase Control of AC Machines of Small Power Ratings
   supervisor: Jaroslav Vladář

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

5. ***Maxim Vladislav,*** Assistant Professor
   theme: Steady - State and Transient Analysis of Converter for Switched Reluctance Motor
   supervisor: Juraj Oetter

10. 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
- three specialised laboratories for power 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
- three laboratories for electrical machines

11. Other Activities

11.1 Seminars, Conferences and Meetings

1. Scientific Seminars at the Department

Each month a scientific seminar is organized by the Department where results achieved in research and the results of works of Ph.D. students are presented. Some seminars were organized in co-operation with the Slovak Society for Electrical Engineering and they were led by specialists from well known companies:

- Analytic Computing of Magnetic Fields (29.3.) - Ing. Dobošová, KEP
- Resonant Converters (26.4.) - Ing. Uhrín, Politecnico di Torino
- The Latest Development Trends in Drive Technology of the SIEMENS Company (26.4.) - Ing. Winkler, SIEMENS
- Organisation of Courses on Products of the Texas Instruments (17.5.) - Dr. Tamás Biacs, Budapest
- Development Trends in Devices produced by International Rectifiers (17.5.) - Ing. Pobuda, 3Q Service, Ing. Kalenda, Prague
- Analysis of Steady and Transient States in a Power Converter for Switched Reluctance Motor (4.9.) - Ing. Maxim, KEP
- Development Trends of Drives for Electrical Vehicles (9.11.) - Ing. Hredzák, Napier University of Edinburgh
- Sitrain System Presentation (30.10.) - Dr. Schröder, SIEMENS
- SAM - SIEMENS Automotive Michalovce in Present Time and Future (19.12.) - Ing. Sutoris, SAM

Several short courses were prepared for specialists outside the university:

- Modern trends in Electrical Drives (Tomko, J., Milly, D., Šándor, R., Ďurovský, F.) - May 1995
- Power Electronics and Electrical Drives (Milly, D., Ďurovský, F.) - four courses held in March, June, September and November 1995.

2. High-Tech Workshop, Herľany 1995

On April 30 - May 2 the sixth Scientific Workshop on Advances in Industrial Control was held in the re-training centre of the Technical University in Herľany, near Košice. 12 specialised lectures were presented and they were supplemented by students' presentations. The workshop was successfully organised by staff members of the Division of Automation of Electrical Equipment.

3. Participation in other Conferences and Meetings

- Meeting of University Teachers of Electrical Devices and Apparatus. West-Bohemian University of Pilsen, Czech Republic: Fedor, J.
- Meeting of University Teachers of Electrical Machines. Technical University of Ostrava, Czech Republic: Kostelný, Ferková.
- Meeting of University Teachers in General Electrical Engineering. Technical University of Brno, Czech Republic: Kovalčin.
- International Conference microCAD'95, University of Miskolc, Hungary, Februar 23, 1995. Participants: Ďurovský, Fedák, Ferková, Fetyko, Košč, Milly, Šándor, Tomko. Task: presentation of papers.
- Seminar to the 50th Anniversary KESP FEI STU Bratislava, September 17-18, Fedor, J., Kostelný
- Seminar to the 90th and 50th Anniversary ÚESP VUT FEI Brno, November 1-2, Fedor, J.
- Scientific Conference TRANSCOM. Žilina, June 29-30, Fedor, J.

11.2 International Co-operation

1. International Projects

- **Microcomputer-Controlled Electrical Drives in Industrial Automation.**

  TEMPUS JEN-02177SQ-94 Project.
  Period: 1995 - 96
  Co-ordinator: Viliam Fedák
  Consortium: Napier University of Edinburg, Universidad Politecnica de Valencia, Politecnico di Torino.
  Target group: STU Bratislava, VŠDS Žilina, VSŽ Mart, s.r.o. Košice, VSŽ Remel, s.r.o. Košice, ZPA, a.s Prešov, SEZ, a.s. Krompachy.

  Goals: to exchange mutual experience to maintain the knowledge level, to revise the Bc. Course curriculum, to disseminate the JEP outcomes.

- **Information Systems in Industry.**

  TEMPUS JEP-09484-95.
  Period: academic years 1995/96 - 1997/98
  Co-ordinator: Prof. Karol Flórián, rector TU
  Contractor: Juraj Haluška
  Institutions involved: TU Košice - Faculty of El. Engineering and Informatics, Faculty of Metallurgy, University of Transport and Communication, Žilina, 1st Private Secondary School Košice, VSŽ Research and Testing Institute, Electronic Control Systems, Ltd.Bratislava, Fachhochschule Ulm, University of Calabria, Universita di Salerno, the Nottingham, Trent University, Transtech Parallel System, Ltd.
  Objectives: Development of Interdisiplinary Studies in a Priority Subject Area: Information Technology.

2. Visits to Foreign Institutions

- Fedák, V., Fedor J.: Warszaw University of Technology and AGH Krakow. 16 - 21 Jan. Task: possibilities for new forms of collaboration.
- Fedák, V. - Fetyko, J.: University of Miskolc, Hungary, 21 - 23 Feb. Task: participation in activities of the microCAD'95 conference and preparation of plans for collaboration.
- Fetyko, J.: University of Miskolc, Hungary, 14 - 16 June. Task: participation in Int. TEMPUS Workshop on Mechatronic Courses. Defence of the dissertation (as reviewer).
- Fedor, J., Fetyko, J.: University of Miskolc, Hungary, 4 July. Task: participation at the Int. Workshop Courses for Integrated Energy Engineering Programmes with European Studies.

3. Study Stays Abroad

Staff:

Fedák, V.: Politecnico di Torino, Italy. 25 May - 7 July.

Granted by IMG TEMPUS 94-SQ 2176.

- Kovalčin, S.: Napier University of Edinburgh, UK. 20 June - 31 July. Granted by IMG TEMPUS 94-SQ 2111
- Fedák, V.: Napier University of Edinburgh, UK. 21 Oct. - 3 Nov. Granted by JEN 02177SQ-94 project.
- Fetyko, J.: Politecnico di Torino, 17 Nov. - 8 Dec. Granted by JEN.
- Oetter, J.: Politecnico di Torino. 17 Nov. - 1 Dec.. Granted by JEN.
- Fedor, J.: Univ. Politecnica de Valencia.16 - 30 Nov. Granted by JEN.
- Tvrdoň, M.: Univ. Politecnica de Valencia. 16 - 30 Nov. Granted by JEN.
- Kaňuch, J.: Technical University of Budapest, Hungary. 5 Nov. - 6 Dec. Granted by the CEEPUS project.

Postgraduate students:

- Uhrín, R.: Politecnico di Torino, Italy. Sept. 94 - July 95, 10 months, Ph.D. student accepted by the Politecnico, the 3rd year.

4. Foreign Visitors

Staff:

• Dr. Kazimierz Jagiela	Politechnika Czestochowska, Poland	15-17 May
• Prof. Tivadar Szarka	University of Miskolc, Hungary	
• Dr. Jerzy Kudla	Politechnika Slaska, Gliwice, Poland	10 July
• Dr. Hans P. Schröder	SIEMENS Sitrain	30 Oct.

Students:

• Imre Városi	BME - TU Budapest, Hungary granted by the CEEPUS programme	2 Nov. - 1 Dec.

5. Membership in International and National Professional Societies

- EPEA (European Power Electronics and Electrical Drives Association): Fedák
- SES (Slovak Society for Electrical Engineering): Fedák, Fedor, J., Fetyko, Kaňuch, Kováčová, Kovalčin, Pokorný, Šándor, Timko, Tomko, Zboray.

11.3 Joint Projects with Industrial Sector

1. Development of a Compact Three-Phase Motor Starter. SEZ, a.s. Krompachy, HZ 13/0415/94 (continues also in 1995). Leader: Fedor J., grant (without VAT): 1.200.000 Sk
2. Consultancy within the mutual agreement of collaboration. ARTEP, a.s. Košice, HZ 3/0415/94, (continues also in 1995). Leader: Fedor, P., grant: 11.000 Sk/monthly.
3. Development of partial programmes. Slovenská investičná poisťovňa, a.s. Košice. HZ 1/0415/95. Leader: Fedor, P., grant: 21.000 Sk
4. Design of Repair of Asynchronous Machines of Run-off Roller. VSŽ Oceľ, s.r.o. Košice. HZ 4/0415/95. Leader: Tomko, J., grant: 150.000 Sk
5. Report and Choice of a Drive Enabling to Control Air Fans Based on the Anlysis of Waste Gases. VSŽ Oceľ, s.r.o. Košice. HZ 7/0415/95. Leader: Ďurovský, F., grant: 50.000 Sk
6. Design and Construction of Sensing and Evaluation the Temperature in Drying Chambers. Šíravar, a.s. Michalovce. HZ 8/0415/95. Leader: Šándor, R., grant: 95.000 Sk
7. Development of the Programme for Calculation of an Asynchronous Motor. VSŽ REMEL, s.r.o. Košice, HZ 9/0415/95. Leader: Fedor, J., grant: 20.000 Sk
8. Analysis of the Damages TIR Converters of Finishing Line TŠP 1700 in VSŽ Košice due to Supply Voltage Interruptions. VSŽ Teplá valcovňa, s.r.o. Leader: Tomko, J., grant:165.000 Sk
9. Comparing Analysis of the Controlling Systems. Regula, a.s. Košice. HZ 16/0415/95. Fedor, P., grant:12.000 Sk
10. Consultancy and Choosen Tasks Solutions in the Field of Technological Processes Control. Regula, a.s. Košice, HZ 17/0415/95. Leader: Fedor P., grant:11.000 Sk/monthly.

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