

DEPARTMENT OF POWER ELECTRICAL SYSTEMS

General Information

Department of Power Electrical Systems was founded in the academic year 1955/56 as the Department of Electric Traction and Energetics at the Railway University in Prague. Since 1992 the department has been a part of the Faculty of Electrical Engineering.

The department had originally an accreditation in a field of "Electric Traction and Energetics". The department graduates were formerly trained mainly for 24 and 12 FMD, for industrial plants producing electric traction equipment (Škoda Pilsen, ČKD Trakce Prague, ŽOS Nymburk, ŽOS Vrútky), for both urban and industrial transport and for the scientific and research laboratories in the electro-technical industry.

The highly important period for the department was during years 1991 – 1994. In those years, a TEMPUS project JEP-1939/91-94 was accepted and realized. The project entitled "Improvement of Educational Activities in Power Electronics and its Applications" considerably affected the next heading of the department. The aims of the project were: a creation of a new curriculum for Power Electronics, Electric Drives and Electrical Machines, setting up new laboratories, purchase of computing and measuring hardware, mobility of students and staff. The universities in Catania, Roma, London and Helsinki co-operated and guaranteed this project. The results of the project set the department forward in its effort to become a modern department with a high-level educational programme. In 1996 the department finished a TEMPUS project JEN-01939SQ-94 representing a continuity of the project mentioned above.

In 2005, the Faculty of Electrical Engineering underwent a vast reconstruction. A section of Power Electronics was secluded from the Department of Power Electrical Systems together with a part of Department of Electronics and Electrotechnology and formed a new Department of Mechatronics and Electronics.

Change of the labour market enforced the department, besides its own traditional educational and research activities, to look for other possibilities of employability of its graduates. Nowadays the department is divided into the section of Electric Power Systems and section of Electric Drives and Electric Traction. Educational and research activities of these sections guarantee a wide professional orientation which covers almost whole power electrical engineering branch.

In the academic year 2005/2006, a three-degree study has been put to an effect at all universities in Slovakia. Department of Power Electrical Systems has been granted an accreditation for a bachelor degree in a study programme Electrical Engineering; for master degree in a programme Electric Power Systems, Electric Drives and Electric Traction. For PhD degree, third study degree, the department was accredited in a study programme of Power Electrical Engineering.

Within the complex accreditation in 2015, University of Žilina confirmed its position as university. Department of Power Electrical Systems gained right to bestow the Bachelor degree in study program of Electrical Engineering, master degree in study programs of Electric Power Systems, Electric Drives and Electric Traction.

Since 1997 the department has had an accreditation for PhD degree study in a field of "Power Electrical Engineering ", with the following branches: Electric Drives, Electric Machines and Apparatus, Power Electronics and Electric Traction.

Department is equipped with high quality computer and measuring technology in the area of technical infrastructure. The substantial improvement of department was achieved mainly by the help of EU Structural

Funds, which enabled reconstruction of rooms of department as well as the departments' instrumentation. This was possible mainly by the project: Centre of excellence of power electronics systems and materials for their components I., II.

Freescale Semiconductor from the Czech Republic provided a big support for the department by generalizing latest technologies in the area of digital signal controllers. Department was able to apply for grant research projects on this basis. Department solved several VEGA, KEGA and SRDA projects recently, which have identified students, graduates and staff of the department.

Department intensively cooperates with significant companies from Slovakia. These are mainly Slovenské elektrárne, Slovenska elektrizačná prenosová sústava, Stredoslovenská energetika, EVPÚ Nová Dubnica, Freescale Semiconductor, SIEMENS, ŽSR, SEZ Krompachy and others.

Staff of the Department

Head of the Department:	Juraj Altus
Vice-head of the Department:	Alena Otčenášová
Secretary:	Darina Rufusová

Sections of the Department

Section of Electric Power Systems

Head of the Section:	Alena Otčenášová
Professors:	Juraj Altus
Associate Professors:	Peter Braciník, Alena Otčenášová, Marek Roch
Senior Lecturers (with PhD):	Josef Beran, Miloslav Bůžek, Marek Höger, Ivan Litvaj, Michal Reguľa

Section of Electric Drives and Electric Traction

Head of the Section:	Ján Vittek, Pavol Makyš from September 2015
Professors:	Valéria Hrabovcová, Ján Vittek, Pavol Rafajdus
Associate Professors:	Milan Pospíšil
Research Fellows:	Pavel Lehocký, Vladimír Vavrúš, Juraj Makarovič, Lukáš Gorel
Senior Lecturers (with PhD):	Pavol Makyš, Matěj Pácha from November 2015, Marek Štulrajter

Postgraduate Students

Internal (full-time):	Peter Dúbravka (from December 2015), Lukáš Gorel (until October 2015), Marek Mušák (until December 2015), Michal Reguľa (until August 2015), Dominik Szabó (until August 2015), Michal Baherník, Roman Bodnár, Peter Butko, Tomáš Fedor, Adrián Peniak, Martina Látková, Filip Suško, Ľuboš Struharňanský, Michal Repák (from September 2015)
External (part-time):	Dávid Kaprál (from September 2015), Ján Sitár (until August 2015), Marek Bañas, Michal Janíček, Milan Diko

Education

Courses in Bachelor and Master Degree Programmes

Bachelor Degree Programmes

Code	Title	Sem.	Hours/Week
			L-S-LE*
Courses at the Faculty of Electrical Engineering			
3B0104	Basics of Electrical Engineering	1	1 – 2 – 0
31412	Project Learning 1: Solar Team Slovakia	1	1 – 3 – 0
3B0109	Practice (60 hours)	1	0 – 0 – 0
31311	Programming languages 2	3	2 – 0 – 2
31404	Work Safety in Electrical Engineering	4	2 – 0 – 1
31408	Electricity Distribution	4	2 – 1 – 1
31411	Electric Machines in English 1	4	1 – 1 – 0
31447	Production and Maintenance of Electrical Devices	4	2 – 1 – 1
31454	Electric Machines	4	4 – 1 – 2
31105	Materials and Technologies in Electrical Engineering	4	2 – 1 – 1
31500	Electrical Apparatus	5	2 – 0 – 2
31501	Electric Traction 1	5	3 – 2 – 0
31507	Electric Power Systems 1	5	3 – 0 – 2
31509	Selected Chapters from Electric Machines	5	2 – 0 – 2
31512	Electric Drives 1	5	3 – 1 – 1
31514	Electric Machines in English 2	5	1 – 1 – 0
31517	Electrical Standards and Metrology	5	2 – 0 – 1
31525	Mechanics of Power Lines	5	2 – 2 – 0
31559	Application of Digital Signal Processors 1	5	0 – 0 – 2
31600	Bachelor Thesis	6	0 – 2 – 0
31602	Bachelor Project Electric Traction	6	0 – 0 – 6
31607	Electric Traction	6	6 – 0 – 4
31608	Electric Drives 2	6	6 – 2 – 2
31610	Electric Power Systems 2	6	6 – 2 – 2
31615	Quality Management	6	4 – 2 – 0
31632	Application of Digital Signal Processors 2	6	0 – 0 – 4
31633	Bachelor Project Electric Power Systems	6	0 – 0 – 6
31637	Bachelor Project Electric Drives	6	0 – 0 – 6
32413	Fundamental Design in Electric Power Systems	6	0 – 0 – 2
Courses at the Faculty of Mechanical Engineering			
211062	Electric Power Systems	1	2 - 2 - 0

*(L) lessons - (S) seminars - (LE) laboratory exercises

Master Degree Programmes

Code	Title	Sem.	Hours/Week
			L-S-LE*
Courses at the Faculty of Electrical Engineering			
3I4101	Transients in power system	1	2 – 1 – 1
3I4102	Power Plants	1	2 – 2 – 0
3I4103	Electric Energy Generation	1	3 – 1 – 1
3I3100	Analysis of Electric Machines	1	2 – 0 – 2
3I3101	Control of Electric Drives 1	1	3 – 2 – 0
3I3102	Dynamics and Energetics of Electric Traction	1	2 – 2 – 0
3I3103	Electric Traction Vehicles	1	3 – 0 – 1
32207	Electric Traction	2	2 – 1 – 2
32208	Electric Drives in Electric Power Systems	2	2 – 1 – 1
32209	Power stations	2	2 – 0 – 1
32210	Electric heat and light	2	2 – 2 – 0
32213	Information Systems in Electric Power Systems	2	2 – 0 – 2
32337	Special Electric Machines	2	2 – 0 – 2
32218	Power Supply of Electric Railways	2	2 – 2 – 0
32224	Programming of Microcomputer Systems	2	2 – 0 – 2
32228	Control of Electric Drives 2	2	3 – 2 – 0
32229	Control of Electric Power Systems	2	2 – 1 – 1
32335	Simulation languages in Electric Power Systems	2	2 – 0 – 2
32231	Sensors, Actuators and Interfaces	2	2 – 0 – 2
32241	Calculations of Electrical Networks	3	2 – 2 – 0
32303	Sensorless Control of Electric Drives	3	3 – 1 – 1
32308	Discreet Control of Electric Drives	3	3 – 0 – 3
32309	Electric heat	3	2 – 2 – 0
32327	Negative Influences on Power System	3	2 – 2 – 1
32333	Control of Electric Drives 1	3	3 – 1 – 1
32334	Annual Project	3	0 – 0 – 4
32336	Lighting Technique	3	2 – 1 – 0
32112	Programmable Logic Controllers	3	2 – 0 – 2
32343	Electric Traction Vehicles	3	3 – 0 – 1
32402	Diploma Thesis	4	0 – 2 – 0
32404	Diploma Seminar	4	0 – 0 – 4
32409	Economy in Electric Power Systems	4	4 – 4 – 0
32412	Materials in High Voltage Technology	4	4 – 0 – 4
32413	Basics of Design in Electrical Power Engineering	4	0 – 0 – 2
32414	Quality Management of Enterprise	4	2 – 4 – 0
Courses at the Faculty of Mechanical Engineering			
2N111	Electrical Traction Equipment	2	3 – 2 – 0

*(L) lessons - (S) seminars - (LE) laboratory exercises

Research & Development

Research and development activities of the **Electric Power System** section are focused on issues concerning electricity generation, transmission and distribution. The research activities oriented on electricity generation are mainly focused on a modelling of the operation of renewable energy sources. Acquired knowledge and results are used to design simulation models, which are thereafter applied in power system analyses as well as in an optimization of renewable energy sources' deployment within virtual power plants.

Scientific and research activities in the field of electricity transmission and distribution are focused on a modelling of electric power system operation, especially on an application of the concept of intelligent networks (Smart Grids) to the control of both power transmission and distribution networks. A use of different artificial intelligence approaches (expert systems, multi-agent systems) and an application of intelligent electronic devices are the key topics of the research in this field.

An integral part of the research activities of the department is solving the issue of power quality in the distribution or transmission system. The issue is solved comprehensively. Attention is given to the causes of poor quality of supply, EMC, statistics in different locations of the system and of course, possibilities for improvement through the application of the proposed device or other feasible measures.

The section of Electric Drives and Electric Traction mainly focuses on control of all electrical drives types such as DC motors, AC motors and special drives with different type of rotors (SRM, BLDC, Stepper Motor). Research focus can be divided into the following areas:

Sensorless control of electric machines – this problematic allows increasing the overall drive reliability, reduce the drive size and therefore it is still very popular. It includes research of estimation algorithms and control techniques for DC and AC drives (IM, PMSM, BLDC). Traditional methods are usually applied for the higher speed range drive. For the low, even zero speed there are methods and algorithms which require high frequency signal injection. Currently, the sensorless techniques form the basis of some control systems, characterized as fault tolerance system, which means ensuring at least partial operation under any circumstances. The research results have been presented at significant international conferences.

Design of new progressive control methods – in this area the research has been focused on methods which use forced dynamic control or sliding mode control. New method which has been designed is called Hyper sliding mode control. This scheme does not need any PI controllers what means more easy implementation to industrial application.

Design and application of control algorithms for linear motors drives – linear motors are very progressive especially for high dynamic applications. Research activities cover designing of new control methods which have capability to avoid all complaints of linear motors such as non-linear friction, cogging torque and other problems related with high precise positioning algorithms.

Design of energy flow control in hybrid railway vehicles – hybrid vehicles are considered as a very progressive type of railway vehicles. The most needed issues involve a primary source operation optimization (catenary or a diesel engine) or braking energy storage. Conventional vehicles use friction brake and the braking energy is lost as a heat, while in hybrid vehicles the energy can be stored e.g. in supercapacitors or modern electro-chemical cells (Lithium based systems). Research results have been published at several scientific conferences and implemented in an international commercial project.

Within the department, the research is oriented also to electrical machines, mainly modern design and optimization method of any types of electrical machines with capability of identifying the parameters and

characteristics of these machines and their possible uses in industry, advanced propulsion or in electric traction.

Project „Solar Team Slovakia“ - the project is aimed at cooperation between students, companies, University and Academy of Fine Arts in the development of solar car for competition the Bridgestone World Solar Challenge in Australia. This cooperation shall develop scientific and technological potential of Slovakia (clever young students, the automotive industry, knowledge and experiences of educational institution). The project aim is to build the first Slovak solar car using new technologies and innovations. The project has, however, mainly to improve education, strengthen active cooperation with practice, popularizing the study of science and technology and create a development environment aimed at the automotive industry. The project now involves more than 50 students from various disciplines.

ExpLab laboratory of renewable energy sources

The function of the laboratory is to examine essential operating characteristics of renewable energy sources, especially photovoltaic systems and wind turbines, with the aim of taking an advantage of lessons learned in the development of simulation models for analyses of power system with renewable energy sources.

The laboratory equipment consists of a small wind power and photovoltaic power plant, which includes a system for predicting the production of photovoltaic power plants using image data from NOAA satellites.

Laboratory of high voltage

The laboratory is equipped with measuring and testing equipment for testing electrical strength as well as other parameters of insulation materials and elements used in high voltage engineering up to 300 kV.

The laboratory is operated in the cooperation with SSE, a.s. in the analyses of materials' characteristics, reasons of the faults of high voltage devices and the testing of protective means. It is also used for teaching activities

Laboratory of power electrical systems

The laboratory of power electrical systems is used for the research oriented on the application of Smart Grid concept in medium voltage networks. The research is mainly focused on the application of artificial intelligence (expert systems, multi agent systems) and intelligent electronic devices for a fault location and network reconfiguration with the goal to minimize the number of customers without electricity supply, as well as on the control of virtual power plants consisting of renewable energy sources, which are connected to the medium voltage network.

The laboratory is equipped with a 3-phase model of a medium voltage power line. The model is monitored and controlled by the computer and it consists of modules representing cable as well as overhead power line sections, remote controlled devices, protection relays and adjustable loads.

Laboratory of power quality

The Laboratory of power quality is equipped with measuring devices obtained due to the international project SK-CZ "Cooperation between the University of Žilina and the VŠB-TU Ostrava on the improvement of the quality of education and preparation of researchers in the field of electrical power engineering", which was funded by EU funds. Purchased measuring system is both used in the laboratory as well as in the field measurements. It consists of power quality analysers designed according to the standard STN EN 50160,

measuring accessories, an appropriate software and a SCADA system, which enables online data acquisition of all variables and parameters measured by power quality analysers, their analysis and graphical presentation through personal computers.

Experiments are made on models of 110 kV and 22 kV power lines. The measuring system enables to study different sources of disturbance, the influence of their mutual operation as well as disturbance propagation along modelled power lines for different operation conditions.

Both models are equipped with remote controlled 4Q electronic meters enabling remote data acquisition and evaluation.

Laboratory of electric drive control

The laboratory of electric drive control has been created in cooperation with Freescale Semiconductor, Inc. in order to familiarize students with practical applications of electric drives and all the problems of real applications.

The electric drives laboratory stands consist of Freescale 56F8346 DSC Controller Board or Freescale MPC 5567 Controller Board, a low voltage power stage Freescale 16 V / 120 W and a selectable electric machine – asynchronous machine (Siemens, voltage 21/12 V power 90W) or permanent magnet synchronous machine (TG-Drives, voltage 21/12 V, 90W). Each electric drive stand is supplied by a low-voltage source and equipped with the debugging tools Freescale USB-TAP.

Students can use other Freescale development tools as TOWER system, SLK (Student learning kits), etc. The laboratory also serves as a base for competitions like Students' Freescale Technology Day and Freescale Cup – smart car race. The laboratory is Freescale certified and registered in the Freescale University Program.

Lab is also equipped with three research stands. The first one consists of two permanent magnet synchronous machines connected with a flexible coupling designed for parameters' investigation and control algorithms for such drives.

The second stand covers a linear engine with permanent magnet synchronous machine of 4 kW. Its track is 2640 mm long and the machine is able to develop a torque of 200 Nm at speeds of 4.2 m/s. The drive load is simulated by an induction machine. Linear motor is supplied from three-phase inverter by VONSCH and controlled by a digital signal controller Freescale MC56F8346.

Third stand consists of 3-axis milling machine with linear motors in X and Y axes. Vertical displacement is handled by a step-machine. Horizontal motors have a special construction of the windings with non-ferrous core on the moving part, thus with no cogging torque. This structure brings ability for a high accuracy positioning, practically limited by the accuracy of the position sensor only. These machines have been developed in collaboration with the company EVPÚ, a.s., Nová Dubnica and supported by the Slovak Research and Development Agency (APVV-99-031205). The control of power converters is handled by two Freescale MC56F8367 units. Positioning and the cutter commands use CNC Mach3 interface and software.

Centre of Excellence of Power Electrical Systems and Materials for their Components

In the laboratory there are implemented project activities of centres of excellence (CEEX I and II CEEX), which were implemented within the Operational Programme Research and Development, Measure 2.1 - creation and promotion of excellence in research.

Created laboratory is used for research and verification of new control structures for drive applications (rotational and linear motion). The proposed algorithms have to consider the adverse effects of the power converter (voltage ripple in the DC link, dead time, saturation power components, etc.). For achieving the highest quality of proposed drive, control is necessary to precisely know motor parameters, which can be done by off-line and on-line motor parameter identification methods. Research team also works with new motor control topologies for non-standard types of electrical machines.

Laboratory of Electric Traction

The laboratory is equipped with a combined system of two DC traction motors (50 kW, 600 V) for a standard set of measurements on traction machines. The system is supplied by a remote controlled DC power sources (voltage source 0-750 V, current source 0-250 A). The measurements are supported by analogue and digital equipments, high-end oscilloscope Lecroy WaveRunner 44Xi-A, high voltage probe (up to 6 kV), magnetic probe, vector power analyser Zimmer LMG-500 and two electronic power sources (0-600 VDC, 0-25 A and 0-60 VDC, 0-45 A).

The laboratory is being equipped with another combined system of two AC induction traction motors (50 kW) driven by two converters. This stand is supported by EVPÚ, a.s., Nová Dubnica and Operational Programme Research and Development, measure 2.1 Support of networks of excellence in research and development as the pillars of regional development and support to international cooperation. Such combined system allows all the tasks of modern electric traction drive.

The most attractive part of the laboratory is a locomotive simulator with its main part – the drivers cab. This project is supported by Freescale Semiconductor, Inc., Pars NOVA, a.s. Šumperk (ČR) and ČD, a.s., DKV Brno (Czech Republic). The software part is supported by OpenRails Train Simulator development team. The main aim is to shed light on the real world problems in electric traction.

Laboratory of electrical machines

This laboratory is designed for measurement and identification of the parameters of almost all of electrical machines and their operating characteristics in motoring and generating modes. The laboratory is equipped with modern measuring instruments and dynamometers. The laboratory is used by students from all three levels of education, and of course it is also used for other research activities at the department.

Projects of National Programmes

Research Projects Funded by the Scientific Grant Agency of the Slovak Republic (VEGA)

VEGA 1/0794/14 Unconventional Actuators Control System Research and Development	
Summary:	<p>The research project is focused on the research and development of optimized motion control systems of rotary and linear motors as well as actuators exploiting electromagnets. The core of the project is based on the methods for optimization of actuators power components and their control systems, including the design of the corresponding sensors and if application allows then sensorless control (without controlled variables measurements).</p> <p>Developed intelligent motion systems will use variable structure control or forced dynamics control capable to reduce the order of control system, to achieve precise tracking of the prescribed trajectory with a defined accuracy. Speed and position control algorithms developed on the principles of motion systems parameters identification will be capable to achieve set-point for speed or position with prescribed responses</p>
Realization:	01/2014 – 12/2016
Coordinator:	Ján Vittek
Co-operators:	Vladimír Vavrúš, Pavel Lehocký, Milan Pospíšil, Marek Štulrajter, Matěj Pácha, Lukáš Gorel, Peter Butko, Tomáš Fedor

VEGA 1/0526/13 Modelling multilateral relations economic subjects and increasing quality of decision-making processes with the support of information and communication technologies	
Summary:	<p>The aim of the project is on the basis of research to identify, describe and with using of information and communication technologies to analyze and model the multilateral relations economic subjects at microeconomic as well as macroeconomic level in the context of the economic crisis and the current market conditions. Quality analysis of the current situation enable design of new approaches and methods, which are applicable for improving of quality of decision-making process of economic subjects with extensive support of information and communication technologies reducing risk of wrong decisions and stimulate economic and social development.</p>
Realization:	01/2013 – 12/2015
Coordinator:	Emese Tokarčíková (Faculty of Management Science and Informatics)
Co-operators:	Ivan Litvaj

VEGA 1/0940/13 Research and Development of Switched Reluctance Machines for Automotive Applications	
Summary:	<p>Project deals with scientific analysis of switched reluctance machines for automotive applications. It's focused on three main applications of drives for automotive, where conventional machines in motor or generator mode could be replaced, such as power steering, starter-generator, active damping. Analytic design of such machines will be introduced using modern design methods (e.g. Finite elements method). Static and dynamic elements of equivalent circuit will be designed to support the dynamic simulation model. The simulation model will represent behaviour of such machine in real operation. Based on simulation results, a set of measurements on real machines will be established.</p>
Realization:	01/2013 – 12/2015

Coordinator:	Pavol Rafajdus
Co-operators:	Valéria Hrabovcová, Pavol Makyš, Vladimír Vavrúš, Pavel Lehocký, Peter Dúbravka, Marek Mušák, Juraj Makarovič, Adrián Peniak

Projects Funded by the Cultural & Education Grant Agency (KEGA)

KEGA 030ŽU - 4/2014 The innovation of technology and education methods oriented to area of intelligent control of power distribution networks (Smart Grids)	
Summary:	The aim of the project is to provide students with new forms and education methods, which will help them to build up required professional knowledge and technical skills, especially in the area of intelligent control of distribution networks. The innovated and newly created educational tools will be accessible for students from other universities (home and abroad) and public use through created interactive web page.
Realization:	01/2014 – 12/2016
Coordinator:	Juraj Altus
Co-operators:	Peter Bracíník, Alena Otčenášová, Marek Roch, Marek Höger, Michal Reguľa, Michal Baherník

KEGA 006ŽU-4/2014 Advanced computer locomotive simulator for electric traction and railway based lectures	
Summary:	The aim of the project is to increase a practical education and the attractiveness of electric traction, rolling stock and rail transport fields of study for students of technical universities, as well as related disciplines for students of high schools. As shown in recent years, the practical training of students of electrical and mechanical engineering, as well as transportation engineering faces the legislative and organizational problems. Practical and interactive contact with such difficult fields of study is required, while denied to most of students. Development of advanced computer locomotive simulator we offer students this interactive, safe and access to the practical problems of railway and traction drives. The simulator will also contribute to the attractiveness of study fields, which are currently required by industry again.
Realization:	01/2014 – 12/2016
Coordinator:	Matěj Pácha
Co-operators:	Milan Pospíšil, Marek Höger, Michal Reguľa

Projects of European Structural Funds

ITMS 26220220183: The Research Centre of the University of Žilina	
Summary:	Main research areas are basically focused on the University of Žilina. In each of these areas, the university is considered to excel on European level and is taken into account worldwide. The areas are transportation including control, operation and new materials, construction, mechanical engineering and smart systems, mainly focused on smart buildings operation and renewable energy sources.
Realization:	05/2013 – 06/2015
Coordinator:	Branislav Hadzima, Research Centre
Co-operators:	Peter Bracíník, Marek Roch, Marek Höger, Alena Otčenášová, Michal Reguľa, Michal Baherník

Z 2242032002401: The creation of information portal for the knowledge improvement of cross-border region in the field of Smart Grids	
Summary:	The main project's goal is to create a software application with such a information content, which will help to create and strengthen contacts and a cooperation between inhabitants, an industry sector and educational institutions in cross-border region in a new and perspective area of intelligent electric networks.
Realization:	09/2014 – 05/2015
Coordinator:	Peter Bracíník
Co-operators:	Ivana Brídová, Daniela Piovarčiová, Mariana Kazimírová, Juraj Altus, Alena Otčenášová, Matilda Drozdová, Martina Látková, Marek Höger, Marek Roch

ITMS 26120130023 Creation of the National Qualification System	
Summary:	Creating and updating cards of qualifications by Sectorial council Electrotechnics and cross-section cards of qualifications in application software the National Qualification System
Realization:	10/2014 – 10/2015
Coordinator:	Monika Doményová, Asseco Central Europe, a.s.
Co-operators:	Alena Otčenášová

Other National Projects

1/2015 Research and development of algorithms for mining harvestors type MB	
Summary:	The project is focused on research and development of algorithms for the control of mining harvestors type MB. Drive the combine is carried out using two parallel spere asynchronous motors supplied with frequency converter. The main tasks of this project is to research and develop control algorithms and management methods for different operating modes of the actuator combine, discretization management structures and subsequent implementation in DSP optimization software for interface control unit and a power converter, communication with higher-level systems because of management and diagnostics of the drive . The project will be completed by the experimental verification of the functionality of the real drive.
Realization:	01/2015 – 3/2015
Coordinator:	Pavol Makyš

Co-operation

Co-operation Partners in Slovakia

- Regulatory Authority
- Power System Management, s.r.o. Košice
- VŠVU Bratislava Volkswagen Bratislava
- TU Zvolen
- KIA Žilina

- STU Bratislava: Institute of Power and Applied Electrical Engineering
- TU Košice: Department of Electric Power Engineering
- ABB Elektro s.r.o. Žilina,
- CE Qualite Slovakia Nová Dubnica
- ELTECO Žilina
- ELZA Žilina
- EVPÚ Nová Dubnica
- Bel Power Solutions, s.r.o., Dubnica nad Váhom
- GI-BON Quality systems Žilina
- MARKAB spol. s r.o. Žilina
- NES Nová Dubnica
- SÚTN Bratislava
- PPA Controls
- PV SŽKV Zvolen
- SIEMENS
- Slovak Productivity Center, The University of Žilina
- Stredoslovenská energetika, a.s. Žilina
- SEPS, a.s. Bratislava
- SEZ Krompachy
- Schneider Electric Slovakia spol. s r.o.,
- Sungwoo hitech, s.r.o. Žilina,
- Technický skúšobný ústav Piešťany
- Vinuta Rajec, s.r.o.
- VUKI, a.s. Bratislava
- VUVT Engineering, a.s. Žilina
- VVÚŽ Vrútky
- ZSSK Divízia ŽKV Bratislava
- ŽOS Vrútky
- ŽOS Zvolen
- ŽSR Bratislava
- CARGO Slovakia Bratislava
- IPESOFT spol. s r. o., Žilina
- Sauter Building Control Slovakia s.r.o., Bratislava

International Co-operation Partners

- Aalto University Helsinki, School of Science and Technology, Department of Electrical Engineering, Finland
- Aalto University, School of Electrical Engineering, Finland
- ABB Brno, s.r.o. PTPM Brno, Czech Republic
- ABD Praha, s.r.o. Technika, Czech Republic
- AD Developments Milton Keynes, United Kingdom
- Appraisals Services, Prague , Czech Republic
- AŽD Prague, Czech Republic
- Berner Fachhochschule, Hochschule für Technik und Architektur Burgdorf, Croatia
- Cinvestav Guadalajara, Mexico

- Control Technique Dynamics, Andover, United Kingdom
- CZ Loko, a.s., Česká Třebová, Czech Republic
- Department of Physics, Nottingham, United Kingdom
- České dráhy O12, Prague, Czech Republic
- ELCOM, Prague, Czech Republic
- NXP Semiconductors, Rožnov pod Radhoštěm, Czech Republic
- Hochschule für Technik und Wirtschaft, Dresden, Fachbereiches Elektrotechnik, Germany
- Institut National des Telecommunications, Paris/Evry, France
- Lappeenranta University of Technology, Faculty of Electric Engineering, Finland
- Montanuniversität Leoben, Insitut fur Elektrotechnik, Austria
- Politechnika Gdańska, Poland
- Politechnika Warszawa, Instytut Maszyn Elektrycznych, Poland
- Russian Academy of Sciences, Management Institute of M. Trapeznikova, Russian Federation
- ŠKODA Transportation, Pilsen, Czech Republic
- ŠKODA Electric, Pilsen, Czech Republic
- Technical University of Bochum, Germany
- Technische Universität Darmstadt, Institut für Elektrische Energiewandlung, Germany
- Technische Universität Dresden, Lehrstuhl Elektrische Antriebe und Grundlagen der Elektroenergietechnik, Germany
- Technische Universität Dresden, Institut für Energieversorgung und Hochspannungs-Technik, Germany
- Technische Universität Graz, Fakultät für Elektrotechnik, Institut für Elektrische Machines und Antriebe Institut der El. Leistungssysteme, Austria
- Technical University Cluj-Napoca, Romania
- Telmining, s.r.o. / T-Machinery, s.r.o., Ratíškovice, Czech Republic
- TU Budapest, Hungary
- University of Bradford, Leeds, United Kingdom
- Università degli Studi di Catania, Dipartimento Elettrico Elettronico e Sistemistico, Italy
- University of East London, Department of Electrical and Electronic Engineering, United Kingdom
- University of Nottingham, United Kingdom
- Universidade do Porto, Portugal
- University of Maribor, Institute of Electrical Power Engineering, Slovenia
- University of Picardie – Jules Verne, Amien, France
- VŠB – TU, Ostrava, Czech Republic
- VÚT Brno, Department of Electrical Power Systems, Czech Republic
- University of West Bohemia, Pilsen, Czech Republic
- Železniční zkušební okruh VÚŽ Cerhenice, Czech Republic

Visitors to the Department

Name	Institution	Length of stay
Dr. Evgeny Fedotov	Kazanskij Gosudarstvennyj Energetičeskij Universitet, Russian Federation	151 days

Visits to Foreign Institutions

Name	Institution	Length of stay
doc. Ing. Peter Bracíník, PhD.	Department of Power Electrical Engineering, VUT Brno, Czech Republic	2 days
	The University of Monte Negro. Podgorica, Monte Negro	1 day
prof. Ing. Pavol Rafajdus, PhD.	TU Eindhoven, Netherlands	1 day

Other Activities

Invited Lectures/Papers

Energy monitoring and system control	
Customer:	The University of Monte Negro Podgorica, Monte Negro
Lecturer:	Peter Bracíník
Date:	22nd May2015

Membership in International Institutions/Committees

Juraj Altus	Representative of the University of Žilina, CIRED, CZ
	Representative of Slovakia in International Energetic Agency IEA, Paris
	IEEE senior member
	Member of international scientific committee of EPE 2015, Ostrava, CZ
Ján Vittek	Science PG Group, New York, member of editorial group for Journal of Electrical and Electronic Engineering
	Wroclaw University of Technology, Poland, Associate Editor of Scientific Papers of the Institute Electrical Machines
Alena Otčenášová	Member of international scientific committee of conference EPE 2015, Ostrava, CZ
Peter Bracíník	Member of IEEE
	National delegate and member of program committee of HORIZON 2020 for "Safe, clean and effectively used energy", Belgium
Matěj Pácha	Senior Member of IEEE
	IEEE Czechoslovakia Section, Section Chair
	IEEE Industry Applications Society, Chapter and Membership Development, Senior Membership Chair
	IEEE IAS/IES Joint Chapter committee member
	Member of expert group Research and development CZ LOKO, Česká Třebová, CZ
Milan Pospíšil	Vice-Chairman of committee for PHD thesis defence in the scientific field of Energetics, FEI VŠB TU Ostrava, CZ
Pavol Rafajdus	IEEE senior member
	Member of international committee of conference Mechatronika 2015
Pavol Makyš	Member of IEEE
Vladimír Vavrůš	Member of IEEE
Marek Roch	Member of IEEE
Marek Höger	Member of IEEE

Membership in National Institutions/Committees

Juraj Altus	Departmental Committee for PhD thesis defence in a field of Electric Power Systems in Bratislava,
	Member of the commission of „Aurel Stodola Award in Power Engineering“, SE Bratislava
	Member of Working group, Accreditation committee (OV15)
Ján Vittek	Journal Editorial Board Acta Electrotechnica et Informatica, FEI TU Košice
	Faculty committee for PhD thesis defence in the field of Mechatronics, SjF TU Košice
	Member of Working group, Accreditation committee (OV15)
Valéria Hrabovcová	Member of Slovak Electro-technical Committee at SUTN
	Member of the SRDA Board for the programme “Human Potential in a Field of Research and Development and Popularisation of Science (LPP)”, Bratislava
	Departmental Committee for PhD thesis defence in a field of Power Electrotechnics at FEI STU, Bratislava
	Faculty Committee of PhD study in Mechanical Faculty TU Kosice in the field of Mechatronics
	IEEE Senior Member
Alena Otčenášová	Chairman of the Commission for the first attestation in the category teacher and subcategory secondary school teacher for training electrical subjects – Ministry of Education, Science, Research and Sport of the Slovak Republic
	Chairman of the attestation commission for the second attestation in the category teacher and subcategory secondary school teacher for training electrical subjects – Ministry of Education, Science, Research and Sport of the Slovak Republic
	Member of Electrical engineering sector committee for National qualification system establishment, Ministry of Education, Science, Research and Sport of the Slovak Republic
Josef Beran	Executive board of Association of Electrical Specialist active in SVK with a nationwide competence (chairman)
	Managing editor of periodical „ELEKTROREVUE“, ISSN 1336-8559, with a nationwide operation for the members of Association of Electrical Specialist, registered at the Ministry of Culture under licence number EV 927/08
Miloslav Bůžek	Executive board of Association of Electrical Specialist active in SR
	Periodical „ELEKTROREVUE“, ISSN 1336-8559
Matěj Pácha	Contact person at University of Žilina for cooperation with NXP Inc., the organizer of student competitions
Ivan Litvaj	Slovak Society for Quality, „Schools and Education“ work group member
Peter Bracíník	Member of scientific committee of ELEKTRO 2016, Žilina

Membership in University Boards

Juraj Altus	Departmental committee for PhD thesis defence in a field of Power Electrical Engineering at the Faculty of Electrical Engineering
	Departmental committee for PhD thesis defence in a field of Power Energy Systems at the Faculty of Electrical Engineering
	Scientific board of the Faculty of Electrical Engineering
	Scientific board of the University of Žilina

Valéria Hrabovcová	Departmental committee for PhD thesis defence in a field of Power Electrical Engineering at the Faculty of Electrical Engineering
	Scientific board of the Faculty of Electrical Engineering
Ján Vittek	Departmental committee for PhD thesis defence in a field of Power Electrical Engineering at the Faculty of Electrical Engineering
	Scientific board of the Faculty of Electrical Engineering
Pavol Rafajdus	Scientific board of the Faculty of Electrical Engineering
	Departmental committee for PhD thesis defence in a field of Power Electrical Systems at the Faculty of Electrical
	Vice-dean for Research at the Faculty of Electrical Engineering
Alena Otčenášová	Departmental committee for PhD thesis defence in a field of Power Electrical Systems at the Faculty of Electrical Engineering
Peter Bracíník	Departmental committee for PhD thesis defence in a field of Power Electrical Engineering at the Faculty of Electrical Engineering
Milan Pospíšil	Departmental committee for PhD thesis defence in a field of Power Electrical Engineering at the Faculty of Electrical Engineering
	Departmental committee for PhD thesis defence in a field of Motor Vehicles, Rail Vehicles, Ships and Aeroplanes, Žilina
Marek Roch	Member of the Information and Communication Technology board at the University of Žilina
	Member the Information and Communication Technology board at the Faculty of Electrical Engineering
	Departmental committee for PhD thesis defence in a field of Power Electrical Engineering at the Faculty of Electrical Engineering
Ivan Litvaj	Quality Manager at the Faculty of Electrical Engineering

Publications

Current Content Journals

[1]	MUŠÁK, M. - ŠTULRAJTER, M. - HRABOVCOVÁ, V. - CACCIATO, M. - SCARCELLA, G. - SCELBA, G.: Suppression of Low-order Current Harmonics in AC Motor Drives via Multiple Reference Frames Based Control Algorithm, In: <i>Electric Power Components and Systems</i> , Volume 43, Issue 18, 2015, on line, ISSN: 1532-5016, p. 2059-2068. (in English)
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Journals indexed in a world-wide database (Thomson Scientific Master Journal List or SCOPUS)

[1]	LÁTKOVÁ, Martina – BAHERNÍK, Michal – HÖGER, Marek – BRACINÍK, Peter: FSM Model of a Simple Photovoltaic System, In: <i>Advances in Electrical and Electronic Engineering</i> , Vol. 13, No. 3, 2015, ISSN: 1804-3119, p. 230-235. (in English)
[2]	SZABO, L. - RUBA, M. - FODOREAN, D. - RAFAJDUS, P. - DUBRAVKA, P.: Torque smoothing of a fault tolerant segmental stator switched reluctance motor, In: <i>Komunikacie</i> , Volume 17, Issue 1A, 2015, ISSN: 1335-4205, p. 95-101. (in English)
[3]	DIKO, M. - RAFAJDUS, P. - MAKYS, P. - DUBRAVKA, P. - SZABO, L. - RUBA, M: A novel concept of short-flux path switched reluctance motor for electrical vehicles, In: <i>Advances in Electrical and Electronic Engineering</i> , Volume 13, Issue 3, September 2015, ISSN: 1336-1376, p. 206-211. (in English)

Other Reviewed Foreign Journals

[1]	MIŠÁK, Stanislav – STUČHLÝ, Ján – PROKOP, Lukáš – BRACINÍK, Peter: Možnosti řízení spotřeby energií v rodinných domech v ostrovním provozu, In: <i>Elektro a trh</i> , Vol. 6, No. 1-2, 2015, p. 29-31. (in Czech)
[2]	VITTEK, J. - FTOREK, B. - BUTKO, P. - FEDOR, T.: Energy Optimal Control of PMSM Drive for Time-varying Load Torque, In: <i>Applied Mechanics and Materials : Innovations in Material Science, Applied Mechanics, Control and Information Technologies</i> , vol. 710, 2015,. ISSN: 1662-7482, p. 67-75. (in English)

Papers in proceedings of the world congress/conference published in prestigious foreign publisher such as Springer, Kluwer, Elsevier, John Wiley etc., or published by world-wide reputable scientific institutions such as IFAC, IFIP, IEEE, ACM, IET, SPIE, or listed in Web of Science

[1]	LÁTKOVÁ, Martina – BRACINÍK, Peter – SUŠKO, Filip: The Use of a Finite State Machine Approach for a Simple Photovoltaic System Dynamics Modelling, In: <i>Elektroenergetika 2015, proceedings of the 8th international scientific symposium on Electrical power engineering</i> , Stará Lesná, Slovak Republic 2015, ISBN: 978-80-553-2187-5, p. 140-143. (in English)
[2]	SUSKO, Filip - BAHERNIK, Michal - LATKOVA, Martina - ALTUS, Juraj - ROCH, Marek: Comparison of electricity meters accuracy in the case of degraded power factor and non-sinusoidal current load, In: <i>Elektroenergetika 2015, proceedings of the 8th International Scientific Symposium on Electrical Power Engineering</i> , Stará Lesná, Slovakia, 2015, ISBN:978-80-553-2187-5, p. 81-84. (in English)
[3]	BODNÁR, Roman – OTČENÁŠOVÁ, Alena – REGUL'A, Michal – ALTUS, Juraj: Methodology for probabilistic estimation of equipment trips due to voltage sags, In: <i>Elektroenergetika 2015, proceedings of the 8th international scientific symposium on Electrical power engineering</i> , Stará Lesná, Slovak Republic, 2015, ISBN: 978-80-553-2187-5, p. 496-499. (in English)
[4]	REGUL'A, Michal – OTČENÁŠOVÁ, Alena – BODNÁR, Roman – HÖGER, Marek: Digital Protection Relay for 22 kV Power Line Model with Partial Power Quality Measurement, In: <i>Proceedings of the 2015 16th International Scientific Conference on Electric Power Engineering (EPE)</i> , Kouty nad Desnou, 2015, ISBN: 978-1-4673-6787-5, p. 412-417. (in English)
[5]	LATKOVA, Martina - BAHERNIK, Michal - BRACINIK, Peter - HOGER, Marek: Modelling of a dynamic cooperation between a PV array and DC boost converter, In: <i>IYCE 2015 - proceedings: 2015 5th international youth conference on energy</i> , Pisa; Italy; 2015, ISBN: 978-146737172-8, P. 7 (in English)
[6]	LATKOVA, Martina - BRACINIK, Peter - BAHERNIK, Michal - SUSKO, Filip: Modeling of a DC boost converter behavior in PV system using finite state machines, In: <i>Proceedings of the 2015 16th International Scientific Conference on Electric Power Engineering, EPE 2015</i> , Kouty nad Desnou; Czech Republic; 2015, ISBN: 978-146736788-2, p. 733-738. (in English)
[7]	LITVAJ, Ivan - STANČEKOVÁ, Dana: Decision Making, and Their Relation to the Knowledge Management, Use of Knowledge Management in Decision Making. In: <i>2nd Global conference on Business, Economics, Management and Tourism. Elsevier. Procedia Economics and Finance</i> , Volume 23, 2015, ISSN: 2212-5671, p. 467–472. (in English)
[8]	LITVAJ, Ivan - STANČEKOVÁ, Dana: Knowledge Management Embedment in Company, Knowledge Management Repositories, Knowledge Management Significance and Usage in company, In: <i>2nd Global conference on Business, Economics, Management and Tourism. Elsevier. Procedia Economics and Finance</i> , Volume 23, 2015, ISSN: 2212-5671, p. 833–838. (in English)
[9]	RAFAJDUS, Pavol - PENIAK, Adrian - DIKO, Milan - MAKAROVIC, Juraj - DUBRAVKA, Peter - HRABOVCOVA, Valeria: Using of Suitable Reluctance Motors for Electric Vehicles and Comparison of their Performances, In: <i>2015 IEEE 15th international conference on environment and electrical engineering (IEEE EEEIC 2015)</i> , June 10-13, 2015, Rome, Italy, ISBN: 978-1-4799-7992-9, p. 2056-2060. (in English)

Reviewed Conference Proceedings Abroad (if not included above)

[1]	VITTEK, J. - BUTKO, P. - POSPÍŠIL, M. - FTOREK, B.: Two Approaches Comparison to Energy Optimal Position Control with Constant and Linear Torques, In: <i>Aegean Conference Electrical Machines and Power Electronics Optimization of Electrical & Electronic Equipment; International Symposium on Advanced Electromechanical Motion Systems</i> , ACEMP-OPTIM-ELECTROMOTION 2015, Side, Turkey, 2015, ISBN: 978-1-4763-7239-8, p. 699-704. (in English)
[2]	STRUHARŇANSKÝ, Ľ. - PÁCHA, M.: Combined System for Testing of AC Traction Motors, In: <i>Sborník příspěvků studentské konference Kohútka 2015</i> , Kohútka, Czech Republic, 2015, ISBN: 978-80-214-5239-8, p. 68-70. (in English)
[3]	LITVAJ, Ivan - STANČEKOVÁ, Dana: How to implement, of knowledge management of processes in small and medium business, In: <i>Proceedings - The Eight International Working Conference: Total Quality Management – Advanced and Intelligent Approaches</i> , Belgrade Serbia, 2015, ISBN: 978-86-7083-858–1, p. 147-153. (in English)
[4]	RAFAJDUS, P. - PENIAK, A.- DIKO, M. - MAKAROVIC, J. - DÚBRAVKA, P. - HRABOVCOVÁ, V.: Efficiency and Losses Analysis in Switched Reluctance Motors for Electric Vehicles, In: <i>Aegean Conference Electrical Machines and Power Electronics Optimization of Electrical & Electronic Equipment; International Symposium on Advanced Electromechanical Motion Systems</i> ; ACEMP-OPTIM-ELECTROMOTION 2015, Side, Turkey, 2015, ISBN: 978-1-4763-7239-8, p. 705-710. (in English)

Reviewed Conference Proceedings in Slovakia

[1]	SUŠKO, F. - LÁTKOVÁ, M.: Petersen coil for a model of a 22 kV distribution line, In: <i>TRANSCOM 2015: 11-th European conference of young researchers and scientists</i> , University of Žilina, Žilina, 2015, ISBN: 978-80-554-1046-3, p. 60-64. (in English)
[2]	SZABÓ, D. - ALTUS, J.: Design and Testing of an Injection Transformer for a Dynamic Voltage Restorer (DVR), In: <i>TRANSCOM 2015: 11-th European conference of young researchers and scientists</i> , Žilina, 2015, ISBN: 978-80-554-1046-3, p. 65-69. (in English)
[3]	BŮŽEK, M.: Uzemnenie v sťažených pôdnych podmienkach, In: <i>ELEKTROTECHNOLÓGIA 2015</i> , Tatranská Lomnica, Slovakia, 2015, ISBN: 978-80-553-2139-4, p.: 110-113. (in Slovak)
[4]	BŮŽEK, M.: Technológia opravy traťového úseku Varín - Vrútky, In: <i>ELEKTROTECHNOLÓGIA 2015</i> , Tatranská Lomnica, Slovakia, 2015, ISBN: 978-80-553-2139-4, p. 104-109. (in Slovak)
[5]	VITTEK, J.- BUTKO, P. - FEDOR, T. - STRUHARŇANSKÝ, Ľ.- FTOREK, B.: Two Cost Functions Evaluation for Energy Optimal Position Control with Constant and Linear Torques, In: <i>2015 International Conference on Electrical Drives and Power Electronics (EDPE2015)</i> , The High Tatras, Slovakia, 2015, ISBN: 978-1-4673-7376-0, p. 13-18. (in English)
[6]	VAVRÚŠ, V. - RADVAN, R. - RAFAJDUS, P.: A Power Loss Calculation Method of IGBT SRM Converter, In: <i>2015 International Conference on Electrical Drives and Power Electronics (EDPE2015)</i> , The High Tatras, Slovakia, 2015, ISBN: 978-1-4673-7376-0, p. 521-526. (in English)

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[1]	OTČENÁŠOVÁ, A. - HÖGER M. - ALTUS, J.: Possible use of airborne LiDAR for monitoring of power lines in Slovak Republic, In: <i>Proceedings of the 15th International Scientific Conference on Electric Power Engineering (EPE)</i> , Brno, University of Technology, Czech republic, 2014, ISBN: 978-1-4799-3806-3, p. 477-481. cited in: MARTINEK, Z. - KLOR, T. - HOLY, J.: The reliability operation of the complicated networks at the electrical system. In: <i>Elektroenergetika 2015: proceedings of the 8th international scientific symposium</i> , Košice: Technical University, 2015. ISBN: 978-80-553-2187-5, p. 535-
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[2]	<p>BODNÁR, R. - OTČENÁŠOVÁ, A. - REGULÁ, M. - SZABÓ, D.: Measurement of power quality in low-voltage network. In: <i>ELEKTRO 2014: proceedings of 10th international conference: Slovakia, May 19-20, 2014</i>. ISBN 978-1-4799-3720-2, p. 262-267.</p> <p>cited in:</p> <p>PONCE-SILVA, M. - MORENO-BASALDUA, E.A.: Alternative definitions of energy for power meters in non-sinusoidal systems. In: <i>International Journal Electrical Power and Energy Systems</i>, vol. 64, 2015, ISSN: 0142-0615, p. 1206-1213.</p>
[3]	<p>OTČENÁŠOVÁ, A. - BRACINÍK, P. - DUBOVSKÝ, M.: Voltage dips in the power system and their spread, In: <i>7th International Scientific Symposium on Electrical Power Engineering - ELEKTROENERGETIKA 2013</i>, Stará Lesná, SR, 2013, ISBN: 978-80-553-1441-9, p. 280 – 283.</p> <p>cited in:</p> <p>KAŠPÍREK, M. et al.: Operation of industry forging press and impact on the supply grid, In: <i>Elektroenergetika 2015: proceedings of the 8th international scientific symposium</i>, Košice: Technical University, 2015, ISBN: 978-80-553-2187-5, p. 46-49.</p>
[4]	<p>KOVÁČ, M. - BRACINÍK, P. - HÖGER, M. - ROCH, M. - OTČENÁŠOVÁ, A.: Power Restoration in Medium Voltage Network using Multiagent System, In: <i>Advances in Electrical and electronic Engineering</i>, Volume 11, Number 2, 2013, ISSN: 1336-1376, p. 65-72.</p> <p>cited in:</p> <p>TESAROVA, M. - VYKUKA, R.: Loading of interconnected feeders fed from different substations, In: <i>Elektroenergetika 2015: proceedings of the 8th international scientific symposium</i>, Košice: Technical University, 2015, ISBN: 978-80-553-2187-5, p. 101-104.</p>
[5]	<p>OTČENÁŠOVÁ, A. - ALTUS, J. - BRACINÍK, P.: Power Quality in Practice, Analysis of Power Quality and Available Solutions, In: <i>International Review on Modelling and Simulation (IREMOS)</i>, Vol. 5, N. 4, 2012, ISSN: 1974-9821, p 1672-1678.</p> <p>cited in:</p> <p>BILIK, P. et al.: Energy meter results under fast changing energy flow condition, In: <i>Elektroenergetika 2015: proceedings of the 8th international scientific symposium</i>. Košice: Technical University, 2015, ISBN: 978-80-553-2187-5, p. 133-135.</p>
[6]	<p>ALTUS, J. - OTČENÁŠOVÁ, A.: Connection of photovoltaic power plants into the electricity system in the SR, In: <i>Przegląd elektrotechniczny (Electrical Review)</i>, 2010, ISSN: 0033-2097, p. 159-163.</p> <p>cited in:</p> <p>Holý, J. - Škorpil, J. - Klor, T. - Martínek, Z.: Trends and technologies in the field of energy storage, In: <i>Elektroenergetika 2015: proceedings of the 8th international scientific symposium</i>, Košice: Technical University, 2015, ISBN: 978-80-553-2187-5, p. 480-483.</p>
[7]	<p>LITVAJ, I. - PONIŠČIAKOVÁ, O. - STANČEKOVÁ, D. - DRBÚL, M.: Knowledge processes and their implementation in small transport companies. In: <i>Transport means. Proceedings of the 17th international conference</i>. Kaunas University of Technology, Lithuania, 2013, ISSN: 1822-296X, p. 153-156.</p>
[8]	<p>cited in:</p> <p>TOKARČÍKOVÁ, E. - KUCHARČÍKOVÁ, A. - ĎURIŠOVÁ, M.: Education of students of the study program informatics in the field of corporate social responsibility, In: <i>Periodica Polytechnica, Social and Management Sciences</i>, Vol. 23, 2015, ISSN: 1416-3837, p. 106 – 112.</p> <p>TOKARČÍKOVÁ, E. - ĎURIŠOVÁ, M. - BARTOŠOVÁ, V.: Corporate social responsibility of public administration employees, In: <i>Proceedings of the 25th International Business Information Management Association Conference - Innovation Vision 2020: From Regional Development Sustainability to Global Economic Growth, IBIMA 2015</i>, ISBN: 978-09-860-4194-5, p. 1437-1445.</p>
[9]	<p>VITTEK, J. - MAKYŠ, P. - ŠTULRAJTER, M. - DODDS, S. J. - PERRYMAN, R.: Comparison of sliding mode and force dynamics of electric drive with a flexible coupling employing PMSM, In: <i>ICIT 2008 IEEE</i></p>

[10]	<i>International Conference on Industrial Technology</i> , April 2008, Sichuan University, Chengdu, China, 2008, ISBN 978-1-4244-1706-3, 6 pp.
[11]	cited in:
[12]	KAMINSKI, M. - DROZDZ, K. - SZABAT, K.: Estimation of the mechanical state variables of two-mass system using adaptive Kalman filter, In: <i>11th IEEE International Conference on Power Electronics and Drive Systems, PEDS 2015</i> , Sydney Australia, June 2015, ISBN: 978-1-4799-4403-3, p. 1152-1155. DRÓZDZ, K. - ORŁOWSKA-KOWALSKA, T. - SZABAT, K.: Application of the modified fuzzy Kalman filter to states estimation of the two-mass system, In: <i>IEEE International Conference On Industrial Technology</i> , ICIT 2015, Seville Spain, March 2015, p. 634-639. SERKIES, P. - SZABAT, K.: Application of moving horizon observer for state estimation in drive system with elastic coupling, In: <i>IEEE International Conference on Industrial Technology</i> , ICIT 2015, Seville Spain, March 2015, p. 629-633. DROZDZ, K.: Estimation of the mechanical state variables of the two-mass system using fuzzy adaptive Kalman filter - Experimental study, In: <i>2nd IEEE International Conference on Cybernetics</i> , CYBCONF 2015, Gdynia Poland, June 2015, ISBN: 978-1-4799-8322-3, p. 455-459.
[13]	VITTEK, J. - BRIŠ, P. - BUTKO, P. - FEDOR, T.: Energy saving position control of PMSM drives with constant, linear and quadratic frictions, In: <i>Power electronics, drives and energy systems (PEDES 2014)</i> , <i>IEEE international conference</i> , December 2014, Mumbai, India, ISBN 978-1-4799-6371-3, 6 pp.
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[15]	cited in: BLANK, F. - ROSER, T. - ROTH-STIELOW, J.: Drive system loss minimizing trajectories using constrained non-linear optimization, In: <i>11th IEEE International Conference on Power Electronics and Drive Systems, PEDS 2015</i> , Sydney Australia, June 2015, ISBN: 978-1-4799-4403-3, p. 986-991. PHAM, T.H. - PRODAN, I. - GENON-CATALOT, D. - LEFEVRE, L.: Efficient energy management for an elevator system under a constrained optimization framework, In: <i>19th International Conference on System Theory, Control and Computing (ICSTCC)</i> , 2015, p. 613-618 - ieeexplore.ieee.org KYSLAN K. - ŠLAPÁK V. - LACKO M. - ĎUROVSKÝ F.: Cost functions in finite control set model predictive control of permanent magnet DC machine, In: <i>International Conference on Electrical Drives and Power Electronics (EDPE)</i> , The High Tatras, 2015, p. 124-129 - ieeexplore.ieee.org
[16]	VITTEK, J. - MAKYŠ, P. - POSPÍŠIL, M. - SZYCHTA, E. - LUFT, M.: State - Space control of the drive with PMSM and flexible coupling, In: (2011) <i>Archives of Transport</i> , 23 (1), ISSN: 0866-9546, p. 77-90. cited in: KAMINSKI, M. - SZABAT, K.: Neuro-fuzzy state space controller for drive with elastic joint, In: <i>11th IEEE International Conference On Power Electronics And Drive Systems, PEDS 2015</i> , Sydney Australia, June 2015, ISBN: 978-1-4799-4403-3, p. 373-378.
[17]	VITTEK, J. - VAVRŮŠ, V. - BRIŠ, P. - GOREL, L.: Forced dynamics control of the elastic joint drive with single rotor position sensor, In: <i>Automatika: journal for control, measurement, electronics, computing and communications</i> , Vol. 54, no. 3, 2013, ISSN 0005-1144, p. 337-347. cited in: BRANDSTETTER, P. - HAJOVSKY, J. - PETRYL, O. - SULAK, R. - VERNER, T.: Software support and data collection system for induction motor drive, In: <i>16th International Scientific Conference On Electric Power Engineering, EPE 2015</i> , Kouty nad Desnou, Czech Republic, May 2015, ISBN: 978-1-4673-6788-2, p. 651-656.
[18]	BRIS, P. - VITTEK, J. - MAKYS, P.: Position Control of PMSM in Sliding Mode, In: <i>Advances in Electrical and Electronic Engineering</i> , 7 (1), 2008, ISSN 1804-3119, p. 198-201. cited in:

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