

**English topics for the doctoral program "Electronics and Informatics" for the academic year 2012/13**

No.	Supervisor	Topic	Annotation	Study	workpl.
1	doc. Dr. Ing Vjaceslav Georgiev	<b>Automotive diagnostic</b>	The thesis deals with complex automotive system diagnostics. Methodology of test generation, use of simulation software and modeling, use of HIL and SIL test techniques and evaluation of the general purpose library of models.	Electronics	KAE / RICE
2	Ing. Pavel Drábek, Ph.D.	<b>High voltage converters for electric drives</b>	New topologies of power electronic converters worked at the higher voltage level (systems for voltage uniform spread to individual device – e.g. topology of multilevel converter, resonant converters etc.).	Electronics	KEV / RICE
3	Ing. Pavel Drábek, Ph.D.	<b>Power electronic converters for alternative energy sources</b>	Topologies of power electronic converters for alternative energy sources systems (photovoltaic, wind energy power stations etc.). Analysis of converters behaviour and system diagnostic, EMC issues in low frequency field.	Electronics	KEV / RICE
4	Ing. Pavel Drábek, Ph.D.	<b>Application of modern semiconductor devices</b>	New topologies of power electronic converters using of modern semiconductor devices based on the Silicon Carbide.	Electronics	KEV / RICE
5	doc. Ing. Zdeněk Peroutka, Ph.D.	<b>New Concepts of Propulsion Unit for Full Electric and Hybrid Vehicles</b>	This project deals with new concepts of propulsion unit and their control for a new generation of full electric and hybrid vehicles and cars.	Electronics	KEV / RICE
6	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Václav Šmídl, Ph.D.	<b>Advanced Control of Full Electric and Hybrid Vehicles</b>	This project deals with research of advanced control of full electric and hybrid vehicles. The main attention is paid to research of vehicle energy management and an interaction of the vehicle with its environment (smart grid, integration of the vehicle into an intelligent system of city operator, etc.).	Electronics / Electric Power Engineering	KEV / RICE
7	doc. Ing. Zdeněk Peroutka, Ph.D.	<b>Smart Drives</b>	This project deals with “smart” electric drives (their topologies as well as control algorithms) using modern control and parameter identification theories (e.g. Bayesian approaches).	Electronics	KEV / RICE
8	doc. Ing. Zdeněk Peroutka, Ph.D.	<b>New generation of control system for advanced embedded applications</b>	This project deals with research of optimal solution of a new generation of control system intended for demanding embedded applications integrating advanced control and identification algorithms such as Bayesian estimation, etc.	Electronics	KEV / RICE
9	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Jan Molnár, Ph.D.	<b>New concepts of medium- and high power electric drives</b>	The aim of this project is research of new concepts and topologies of particularly medium-power power electronics converters with high power density.	Electronics	KEV / RICE
10	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Jan Molnár, Ph.D.	<b>Research of Smart Grid Components</b>	The aim of this project is research of new technologies, devices and control strategies for smart grids. The main attention is paid to components employing power electronics and to control of these components and whole smart grid.	Electronics	KEV / RICE

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11	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Václav Šmídl, Ph.D.	<b>Advanced Control of Smart Grids</b>	The aim of this project is research of distributed control algorithms for smart grids including optimal integration particularly of new transport systems into smart grids.	Electronics / Electric Power Engineering	KEV / RICE
12	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Václav Šmídl, Ph.D.	<b>Bayesian estimation method for electrotechnical applications</b>	The aim of this project is to create a probabilistic model of a selected system, to implement a suitable Bayesian estimation technique for its solution, and to demonstrate its advantages over alternative approaches. Bayesian methods are particularly advantageous for applications with limited observations, such as sensorless control of electric drives.	Electronics	KEV / RICE
13	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Václav Šmídl, Ph.D.	<b>Dual control in electrotechnical applications</b>	The aim of this project is to improve control of a chosen system using dual control strategies, i.e. strategies that actively excite the controlled system to improve its identifiability. An example of suitable application domain is sensorless control of electric drives at low operating speed.	Electronics	KEV / RICE
14	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Jan Michalík, Ph.D.	<b>Active filters</b>	This project deals with the research into harmonics in distribution network mitigation and reactive power compensation based on active filters. The main attention is going to be paid to selected perspective topologies of power converters as well as to their control algorithms.	Electronics	KEV / RICE
15	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Jan Michalík, Ph.D.	<b>Control of Current-Source Based Converters</b>	This project deals with the research into the control of current-source converters. The main attention is paid to 4Q configurations of power converters and to an active damping of input LC filter.	Electronics	KEV / RICE
16	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Tomáš Glasberger, Ph.D.	<b>Control of new topologies of medium- and high-voltage converters</b>	The project deals with research of new topologies and control of medium- and high-voltage power electronics converters. The main attention will be paid to multilevel converters. One of the key issues to be investigated is modulation strategy – especially space-vector techniques and synchronous and synchronized modulations.	Electronics	KEV / RICE
17	doc. Ing. Zdeněk Peroutka, Ph.D. / Ing. Martin Janda, Ph.D.	<b>Conductive Currents in Traction Drive and Their Mitigation</b>	The aim of this project is research of conductive currents in traction drive and techniques of mitigation of dangerous harmonic components in trolley current that can harm the function of railway safety systems. The project deals with design of active compensator of these dangerous frequency components and their estimation (FFT, wavelet transformation, complementary curve, etc.).	Electronics	KEV / RICE

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18	doc. Ing. Zdeněk Peroutka, Ph.D.	<b>New Technologies for Self-Consumption of Power and Heating Plants</b>	This project deals with research of new technologies for self-consumption of power and heating plants leading to reduction of their energy consumption and/or improvement of dynamic properties of these power sources.	Electronics / Electric Power Engineering	KEV / RICE
19	doc. Ing. Radek Polanský, Ph.D.	<b>Glass Transition and Its Influence on Insulating Material Properties</b>	Physical aspects of glass transition and the role of glass transition at diagnostics of insulating material condition will be studied. Techniques for record of glass transition and its detailed comparison will be required.	Electrical Engineering	KET
20	doc. Ing. Radek Polanský, Ph.D.	<b>Dynamic Mechanical Analysis of Electrical Insulating Materials</b>	Aspects of dynamic mechanical analysis application, physical matter of processes arising during the application of mechanical stress on solids will be studied. An application of dynamic mechanical analysis in electrical technology diagnostics will be required.	Electrical Engineering	KET
21	doc. Ing. Pavel Trnka, Ph.D.	<b>Implementation of Condition Based Management in Electroinsulating Systems</b>	Objective of the dissertation thesis is procedural and technical access of implementation of Condition Based Management. The thesis deals with electrical insulation of large rotary machines, power transformers and important components of power electric network. Work should contain consistent analysis of current procedures of electrical insulation evaluation and prediction of the remaining life time. Analysis of the deliverables of On-line diagnostics, important parameters calculation procedures proposal, a criterion determination for corrective maintenance acting and proposal of the on-line monitoring system.	Electrical Engineering	KET
22	doc. Ing. Pavel Trnka, Ph.D.	<b>Possible new approaches of electrotechnical diagnostics</b>	Dissertation thesis should contain procedural and technological access of improving currently used methods of diagnostics. Furthermore thesis should discuss utilization of the newest diagnostics technologies. Goal of the thesis is in the searching for new criteria of insulation materials life time evaluation, for instance partial discharges. Research should react on the new trends in the diagnostics appliances for partial discharges measurement. Study of the partial discharges in the higher frequency ranges then today.	Electrical Engineering	KET

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23	doc. Ing. Pavel Trnka, Ph.D.	<b>Improving of the high voltage appliances parameters</b>	The key aspect of the research connected with this thesis should be the study of high voltage appliances subsystems. Highlighted should be the limitations of the current insulation systems and boundaries of the technological process. A Ph.D. student should bring new approaches to the power electrical appliances diagnostics. The On-line diagnostics as for example a partial discharges analysis should be studied and improved. The goal of the thesis is progress in electrical appliances design and improving the diagnostic methods. The Ph.D. research project will be solved in cooperation with the high voltage appliances manufacturers.	Electrical Engineering	KET
24	prof. Ing. Zdeněk Vostracký, DrSc.	<b>Third Mapping project locations and implementation of future power stations in the city – Smart Energy Grid for Electromobility</b>	Analysis of the local and temporal distribution of consumption energy also with regard to electromobility. Optimization of resources with regard to local and temporal distribution of power and energy. The role of residential appliances, as well as sources of energy accumulation and transformation. Integrating various parts of the power system. Technical and economic comparison of variants.	Electric Power Engineering	KEE / RICE
25	prof. Ing. Zdeněk Vostracký, DrSc.	<b>Optimization of co-operation in the island of distributed sources</b>	Analysis of technical, economic and security aspects of island operation. Structure of resources and products with regard to flexibility. Project of the island operation of power systems, electricity and heat. Security of electricity supply - the start of the darkness - accumulation.	Electric Power Engineering	KEE / RICE
26	prof. Dr. Ing. Rainer Haller	<b>Current carrying capability of transmission systems</b>	Analysing of current carrying capability of transmission systems. Development of modelling for current carrying capability of transmission systems. Evaluation of different types of transmission lines based on the developed model. Recommendations for repowering of existing transmission systems.	Electric Power Engineering	KEE

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27	prof. Dr. Ing. Rainer Haller	<b>New Method of Partial Discharge Diagnosis</b>	Studying of existing methods for PD Diagnosis and critical evaluation. Theoretical and practical analysing of the Pulse-Sequence-Method (PSA). Development of evaluation criteria for PD activities in electrical insulation measured by PSA. Evaluation of physical interpretation by PSA. Recommendations for future application of the PSA	Electric Power Engineering	KEE
28	doc. Ing. Pavel Karban, Ph.D.	<b>Computer Simulations of the Dynamic Corona Discharge</b>	Numerical algorithm for the simulation of the dynamic corona discharge in the air proposed on the basis of relevant continuous mathematical model. Computer modeling of positive and negative corona discharges. The numerical model combines the charge distribution in the corona plasma and transport phenomena.	Electrical Engineering	KTE / RICE
29	prof. Dr. Ing. Rainer Haller	<b>Switching of DC Currents in Medium Voltage Networks</b>	Today the vacuum interrupter technology is the leading technology in medium voltage circuit-breakers and switchgears. Beside medium voltage networks, the vacuum circuit-breakers are also used in industrial applications. For the future development of the power networks, one potential field of new developments is medium voltage direct current systems (MVDC). One of the biggest challenges will be the safe interruption of MVDC and to guarantee the safe galvanic separation.	Electric Power Engineering	KEE
30	Ing. Jan Sedláček, Ph.D	<b>Stabilization Criteria for the Numerical Modelling of an Internal Arc</b>	Many investigations have been performed on the effect of internal arc (IA) to medium voltage equipment. There is still no closed scheme available to predict the energy balance of an IA at typical currents of several 10 kA inside a medium voltage cubicle. Typically, an arc will not expand by the magnetic and the convective forces as it would be in free air conditions, and will be limited e.g. by the metal cladding of the cubicle. As a matter of fact, such stabilization at metallic surfaces even can be utilized for controlling an arc.	Electric Power Engineering	KEE