

English topics for the doctoral program "Electronics and Informatics" for the academic year 2013/14

No.	Supervisor	Topic	Annotation	Study	workpl.
1	doc. Dr. Ing Vjaceslav Georgiev	Engineering Principles in Cellular Biology	The Electrical Engineering principles applied in the Cellular Biology. The research and application of electromagnetic fields applied to cells. The modeling and design of microfluidics systems supporting the cell manipulation.	Electronics	KAE / RICE
2	doc. Dr. Ing Vjaceslav Georgiev	Study of "Single Event Effects" (SEE) in semiconductor structures	Research of the effects of an ionizing radiation in semiconductor structures is the topics. The modeling and experiments on real structures. The tester design and statistical signal processing is the main issue.	Electronics	KAE / RICE
3	doc. Dr. Ing Vjaceslav Georgiev	Enhanced ionizing radiation detection by several type of detectors	Research and development of enhanced detection structures with stress on hybrid detection structures compound of several type of detectors. The main subject of research is an electronic for the detectors signal processing	Electronics	KAE / RICE
4	Prof.Dr.-Ing.habil. Rainer Haller, Dr.sc.	Electrical Strength of Hybrid Insulation under different gases	Many investigations had been performed on barrier insulation system in air. However, there is still no closed model available to predict the breakdown in such an insulating system under medium voltage conditions. Additional to that, the forced exchange of insulating gas with higher electrical strength as widely used SF ₆ with those with environmental friendly but of lower electrical strength as N ₂ - O ₂ - gas mixtures needs a lot of basic investigations concerning its electrical breakdown properties. Besides basic investigations of electrical strength a model of breakdown on insulation with barrier under different gas conditions should be developed. The PhD thesis shall address: 1) Literature study of the status of breakdown mechanism in hybrid insulation with gas 2) Performance of appropriate breakdown tests determining of electrical strength for such insulation under different conditions (gas, barrier, field type etc) 3) Developing of a model to predict the breakdown of hybrid insulation under different insulation conditions	Electric Power Engineering / Electrical Engineering	KEE / RICE
5	doc. Ing. Pavel Drábek, Ph.D.	High voltage converters for electric drives	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
6	doc. Ing. Pavel Drábek, Ph.D.	Power electronic converters for alternative energy sources	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

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7	doc. Ing. Pavel Drábek, Ph.D.	Application of modern semiconductor devices	New topologies of power electronic converters using of modern semiconductor devices based on the Silicon Carbide.	Electronics	KEV / RICE
8	doc. Ing. Jiří Masopust, CSc.	Communication and navigation subsystems of picosatellites	Research of special communication and navigation systems for picosatellites. Utilization of software and cognitive radio in space technology. Systems of ground and space segment of PilsenCUBE project. Cooperation in monitoring and control of picosatellites.	Electronics	KAE
9	doc. Ing. Jiří Masopust, CSc.	Multimedia display systems	Research of new generation multimedia display systems. Measurement of quality (QoS, QoE), testing and optimization of display systems. Compression systems. Human-machine interface.	Electronics	KAE
10	doc. Ing. Zdeněk Peroutka, Ph.D.	New Concepts of Propulsion Unit for Full Electric and Hybrid Vehicles	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 / Electric Power Engineering	KEV / RICE
11	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Václav Šmídl, Ph.D.	Advanced Control of Full Electric and Hybrid Vehicles	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	KEV / RICE
12	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Václav Šmídl, Ph.D.	Smart Drives	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
13	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Jan Molnár, Ph.D.	New concepts of medium- and high-power electric drives	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
14	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Jan Molnár, Ph.D.	Research of Smart Grid Components	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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15	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Václav Šmídl, Ph.D.	Advanced Control of Smart Grids	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
16	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Václav Šmídl, Ph.D.	Bayesian estimation method for electrotechnical applications	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
17	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Václav Šmídl, Ph.D.	Dual control in electrotechnical applications	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
18	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Tomáš Komrška, Ph.D.	Active filters	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
19	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Jan Michalík, Ph.D.	Control of Current-Source Based Converters	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
20	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Tomáš Glasberger, Ph.D.	Control of new topologies of medium- and high-voltage converters	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

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21	prof. Ing. Zdeněk Peroutka, Ph.D. / konzultant specialista: Ing. Martin Janda, Ph.D.	Conductive Currents in Traction Drive and Their Mitigation	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
22	prof. Ing. Zdeněk Peroutka, Ph.D.	New Technologies for Self-Consumption of Power and Heating Plants	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
23	doc. Ing. Radek Polanský, Ph.D.	UV curing of thermosets and its application in electrical engineering	Searching for a new thermoset resins with high sensitivity to UV light and its application in electrical engineering. Analysis of physiochemical processes accompanying UV curing of resins. Application of phenomenological and structural methods of diagnostics.	Electrical Engineering	KET
24	doc. Ing. Radek Polanský, Ph.D.	Lifetime analysis of electrical insulating materials by structural analyses	Application of structural analyses for diagnostics in electrical engineering. Searching for a new diagnostic parameters suitable for determination of electrical insulating materials life-time. Long-term thermal endurance tests. Testing of electrical insulating materials according to ČSN EN 60216 standard.	Electrical Engineering	KET
25	doc. Ing. Pavel Trnka, Ph.D.	Possible new approaches of electrotechnical diagnostics	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 using measurement of partial discharges. Research should react e.g. on the new trends in the diagnostics appliances for partial discharges measurement. Study of the partial discharges in the higher frequency ranges than today.	Electrical Engineering	KET

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26	doc. Ing. Pavel Trnka, Ph.D.	Interaction of Inhomogenous Dielectric with Electric Field	The aim of doctoral thesis research should be associated with the phenomena that occur after insertion of an inhomogenous dielectric into the outer electric field. Research connected with properties of selected dielectrics and their use for creating potential barriers in electrical appliances. In inhomogeneous dielectric the barrier causing rearrangements of electrical charge carriers and thus strong internal deformation of electric fields. Studying these phenomena can prevent negative consequences, which may lead to the destruction of a dielectric in so far not suspected places. The work should include a study of the interaction of multicomponent systems with the increased possibility of inhomogeneities at the interface with electric field, study of deformation of the electric field, process of space charge formation, description of the causes of phenomena and suggestions of its elimination.	Electrical Engineering	KET