	English topics for the doctoral program "Electrical Engineering and Informatics" for the academic year 2021/22				
No.	*Supervisor*	*Topic*	*Annotation*	*Study*	*workpl.*
1	doc. Ing. Tomáš Blecha, Ph.D. / assistant supervisor: Ing. Petr Kašpar, Ph.D.	**Wearable electronics technology**	The topic is focused on the issue of wearable electronics, fixed not only on the human body but also as part of smart textiles. Research in this field should focus on appropriate contacting, packaging and fastening technologies with regard to the robustness, reliability, and ergonomics of the device. A part of the research will be the field of "energy harvesting" systems and communication technologies suitable for wearable electronics. This topic should also focus on test and measurement methods and procedures suitable for wearable electronics.	Electronics	KET
2	doc. Ing. Tomáš Blecha, Ph.D.	**Advanced electronic components and systems for high frequency applications**	The topic is focused on the issue of electronic components, elements, and systems realized by advanced technologies and materials with respect to their high-frequency properties. The research will also focus on carbon allotropes (carbon nanotubes, graphene) and their use for electronic elements and sensors. Research in this area may have an overlap in printed electronic components, smart applications, the Internet of Things and Services (IoT and IoS).	Electronics	KET
3	doc. Ing. Tomáš Blecha, Ph.D. / assistant supervisor Ing. Josef Pihera, Ph.D.; Ing. Petr Kašpar, Ph.D.	**Internet of Things and special sensors for diagnostics of HV systems and equipment**	The topic is focused on the diagnostics of high voltage systems and devices using IoT. It is assumed to use special sensors for sensing the appropriate variables necessary to determine the condition of the monitored device. Individual sensors or sensor systems will be designed for IoT compatibility, which also ensures long-term monitoring of the monitored system and on-line transmission of measured data. Emphasis will be placed on diagnostics of insulation systems operating in AC or DC power systems. The topic will also cover the analysis and evaluation of data obtained with respect to the life of the monitored equipment.	Electronics	KET
4	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 and Galium Nitrid. Design of new drivers and control algorithms.	Electronics	KEV
5	doc. Ing. Pavel Drábek, Ph.D.	**Modern power engineering networks (e.g. SMART GRIDs)**	Research and design of new concepts of infrastructure and electrical equipment of transport systems, including electrical equipment of substations, power and charging stations with respect to integration and connection to modern electrical networks.	Electronics	KEV
6	doc. Ing. Tomáš Glasberger, Ph.D. / konzultant specialista Ing. Tomáš Komrska, Ph.D.	**Control of multiphase power semiconductor converters**	The topic deals with the research of suitable topologies and control of multiphase power electronics converters. The algorithms will be designed and optimized by selected criteria, e.g., quality of output quantities, influence on the load, losses in the circuit, fault-tolerant operation. The algorithms will be based particularly on PWM methods, model predictive control, or other optimal control methods.	Electronics	KEV
7	doc. Ing. Tomáš Glasberger, Ph.D.	**Control of multilevel power semiconductor converters**	The topic deals with the research of new topologies and control of medium-voltage power electronics converters. The topologies and the algorithms will be designed and optimized by selected criteria, e.g., distortion of output quantities, influence on the grid or load, losses in the circuit topologies with the utilization of deterministic and stochastic method, genetic algorithms, etc. The algorithms will be based particularly on PWM methods or model predictive control.	Electronics	KEV
8	prof. Ing. Pavel Karban, Ph.D. / assistant supervisor Ing. Petr Kropík, Ph.D.	**Classification of signals using Deep Learning**	The topic aims to use deep learning principles for the analysis and classification of voluminous IoT data. The research will focus on algorithms for data processing from the field of IoT - data from sensors in industrial plants, department stores, or data from environmental monitoring. Furthermore, the work will focus on deep learning in the field of signal classification in electrical engineering and related areas.	Electrical Engineering	KEP
9	prof. Ing. Pavel Karban, Ph.D. / assistant supervisor Ing. Petr Kropík, Ph.D.	**Neural network accelerators for microcontrollers**	The topic aims to use neural network accelerators on a microcontroller platform for machine learning applications and data recognition from various types of physical sensors. The research will focus on using high-level programming languages for microcontrollers, the principles of edge computing, and offline programming to achieve a reliable deployment of the machine learning model on the microcontroller. The aim of these procedures will be the immediate interpretation of the data obtained by the sensors and the minimization of latency and reduction of the load on the transmission path to the Internet. The use of high-level languages will be the basis for the abstraction of the computational part from a specific type of hardware and ensuring the robustness, stability, and portability of the developed solutions.	Electrical Engineering	KEP
10	prof. Ing. Pavel Karban, Ph.D.	**Distributed system for advanced analysis of computer models**	The topic aims to design a distributed system for advanced analysis of numerical and computer models. The research will focus on the general design of architecture and its subsequent implementation in a suitable programming environment. The system will enable massive processing of tasks on computing clusters.	Electrical Engineering	KEP
11	prof. Ing. Pavel Karban, Ph.D.	**Numerical models of physical systems based on surrogate schemes**	Research will be focused on the use of surrogate models such as kriging, random trees or neural networks in advanced design of electrical equipment. The aim of this work is to replace a generally complex and computationally demanding model with a simplified, but still sufficiently accurate, surrogate model. The obtained results will be experimentally verified on a suitable application.	Electrical Engineering	KEP
12	doc. Ing. Václav Kotlan, Ph.D	**Advanced numerical techniques for reducing the complexity of the additive process model**	The aim of this work is to observe new trends in the field of electric heat, to define a basic model for additive processes and to investigate the possibilities of reducing this complex model with the aim of reducing computational demands and time while maintaining	Electrical Power Engineering	KEP
13	doc. Ing. Václav Kotlan, Ph.D	**Using advanced numerical techniques in the process of identifying material characteristics**	The aim of this work is to develop a methodology for identifying missing or incorrect material characteristics of metallic materials. It includes the involvement of advanced techniques such as optimization tools, physical descriptions of state changes and model calibration.	Electrical Power Engineering	KEP

14	doc. Ing. Vladimír Kindl, Ph.D.	**Machine efficiency with non-harmonic power supply**	The work deals with the calculation of losses and efficiency of an electric machine powered by a non-harmonic voltage. Emphasis will be placed on the calculation of losses in iron core and permanent magnets using analytical methods. The target area is electromobility.	Electrical Engineering	KEV
15	Ing. Zdeněk Kubík, Ph.D.	**Modelling and simulation in electromagnetic compatibility**	The topic is focused on numerical methods and their applications for solving of problems in the electromagnetic compatibility. Expected problems: parasitic electromagnetic coupling, grounding, filtering, shielding, circuit and construction topology.	Electronics	KEI
16	Ing. František Mach, Ph.D.	**Magnetic soft-robots and machines**	Proof-of-concept research will aim at the magnetic field interaction with composite elastic materials. From the theoretical point of view, the research will be lead towards the production processes of magnetic elastomers and their characterization concerning mechanical properties. The obtained results will be used for the development of electromechanical systems in applications in robotics and automation.	Electrical Engineering	KEP
17	doc. Ing. Roman Pechánek, Ph.D.	**Methodology of thermal modeling of electrical machines**	The aim of this research is to compile an analytical and FEM combined thermal model describing physical thermal processes in electrical machines. Its subsequent application and verification in RICE laboratories.	Electrical Engineering	KEV
18	doc. Ing. Roman Pechánek, Ph.D.	**Complex electromagnetic and thermal design of modern electrical machines**	The aim of this work is to create a comprehensive methodology suitable for electromagnetic and thermal design of electrical machines manufactured using 3D printing.	Electrical Engineering	KEV
19	doc. Ing. Roman Pechánek, Ph.D.	**Research of cooling methods of modern electrical machines in the automotive industry**	The aim of this research is to develop mathematical thermal models of electrical machines in the automotive industry. The study focuses on the development of "Multiphysics" models, which combine both classical analytical methods and FEM to solve temperature fields with heat transfer by CFD. - water jackets, direct conductors cooling, spray / jet cooling, etc..	Electrical Engineering	KEV
20	prof. Ing. Zdeněk Peroutka, Ph.D.	**New Concepts of Drive Units for Electric Vehicles and Cars**	This topic should discover new concepts of drive units for electric vehicles. The application of these technologies is expected predominantly in both public transportation vehicles (mainly trams and EMUs) and modern concepts of personal cars. This research will be significantly focused on the utilization of high-speed drives.	Electronics	KEV
21	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Jiří Cibulka, Ph.D.	**Control of New Generation of AC Motor Traction Drives**	This topic aims to discover optimal control of new concepts of ac motor traction drives intended pro a new generation of light and heavy traction vehicles (such as trolleybuses, trams, metro trainsets, EMUs, locomotives). The research will be focused on the optimal control theory, while the main attention is going to be paid to the predictive control strategies. The research will also find the solution for difficult traction-specific problems, such as traction drive stability, the drive's interaction with its environment, and noise.	Electronics	KEV
22	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor doc. Ing. Václav Šmídl, Ph.D. et Ph.D.	**Models of Electric Drives and Their Utilization for Fault Diagnostics**	The aim of this topic is a formulation of new mathematical models of ac electrical machines and drives, identification of their parameters and their utilization for control and/or fault diagnostics.	Electronics	KEV
23	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Tomáš Komrska, Ph.D.	**Drive units with high power density dedicated for electric and hybrid vehicles**	This topic should discover new drive concepts for fully electric and hybrid cars. The primary attention is paid to low-voltage (48V) drives with high power density, dedicated to small city vehicles and mild hybrids above all. This research will predominantly focus on technologies using multiphase systems. The control of these drives is also part of this topic.	Electronics	KEV
24	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor doc. Ing. Václav Šmídl, Ph.D. et Ph.D.	**Smart Drives**	This topic aims to define a new class of electric drives and complex mechatronic systems with a higher level of embedded intelligence. The main application of investigated technologies is expected in the fields of robotics, servo-drives, machine tools, and special manipulators and actuators. This research will be focused on new control and parameter identification strategies, especially for ac motor drives (e.g., stochastic approaches, optimal control).	Electronics	KEV
25	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Martin Jára, Ph.D.	**Resonant/soft-switchning converters**	This topic should discover new topologies of power electronics converters with high power density. The primary attention is paid to resonant/soft-switching converters. The topic's research deals with both power circuit solutions, including methods for design optimization and control of proposed converters. The proposed technologies are going to be applied, especially in the auxiliary drives of vehicles/cars and wireless power transfer.	Electronics	KEV
26	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Martin Jára, Ph.D.	**New technologies and materials for high power density converters**	This topic aims to research new technologies and the identification of new materials for the design of high power density power electronics converters. The part of the research is the optimization of converter design utilizing new devices (SiC, GaN, etc.), new materials for passive components, new construction designs, and control strategies. The results of this research are going to be applied in the fields of transportation, airspace, power supplies, and charging technologies.	Electronics	KEV
27	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor: Ing. Jan Molnár, Ph.D.	**New construction designs for power electronics convereters**	This topic aims to propose new construction designs and concepts of cooling systems of power electronics converters. The topic includes the research into the appropriate power electronics devices characterization, definition of measuring techniques, and investigated models' validation. The topic contains both theoretical simulations and experimental validation of proposed solutions.	Electronics	KEV
28	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Tomáš Komrska, Ph.D.	**New Power Electronics Technologies in Power Distribution Grids**	This topic aims to research new technologies, devices, principles, and control algorithms of protections in power distribution grids. The main attention is paid to components employing power electronics and to control these components. The research will predominantly focus on the earth faults in insulated or high-impedance grounded grids.	Electronics / Electrical Power Engineering	KEV
29	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Tomáš Komrska, Ph.D.	**Power Flow Control in Distribution Grids and Active Filters**	This topic aims to research new technologies, devices, principles, and control algorithms of power flow control in distribution grids. The main attention is paid to hybrid and fully power electronics-based solutions.	Electronics / Electrical Power Engineering	KEV

30	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Dr. Ing. Jan Přikryl	**Smart City: New Technologies for City Transportation**	This topic should propose transportation optimization technologies in a city, including optimizing vehicle parks, lines, necessary transport, and power distribution infrastructure. The formulation of mathematical models and modeling and simulations of the above-defined problems will be a part of this topic. The proposed technologies will be verified on data collected in Pilsen, and they can also be implemented in the city of Pilsen.	Electronics / Electrical Power Engineering	KEV
31	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Jan Michalík, Ph.D.	**Control of Matrix and Current-Source Converters**	This topic deals with the research into the control of both matrix and current-source converters. The primary attention is paid to indirect matrix converters, control algorithms with the low switching frequency, multilevel converters, and active damping of the input LC filter.	Electronics	KEV
32	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Martin Jára, Ph.D.	**New configurations of power electronics converters**	The topic deals with the research of new topologies of power electronics converters and their control. The main attention will be paid to configurations using novel power semiconductors, mainly wide bandgap devices. Expected topic outputs are new converters solutions with reduced electromagnetic disturbances.	Electronics	KEV
33	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Martin Sirový, Ph.D.	**Optimization of Energy Efficiency, Flexibility and Dynamics of Thermal Power and Heating Plants**	The topic targets the research of new concepts to improve the operational capacities of thermal power plants and heat power plants to reduce the self-energy consumption, increase the control range, and/or increase the source's dynamics. The solution includes developing conceptual design and simulation verification of the proposed solution using state of the art technologies for energy accumulation and advanced energy management techniques concerning successful integration in power grids with high penetration of unpredictable sources.	Electrical Power Engineering	KEV
34	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Martin Janda, Ph.D.	**Traction Drive Interactions with its Environment**	This topic aims to research unwanted interactions of traction drive with its environment (such as electric or electromechanical interactions, conductive currents, noise). This topic is going to analyze these problems and should propose solutions for the mitigation of these effects.	Electronics	KEV
35	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing. Martin Janda, Ph.D.	**Advanced tools for simulation of electric and hybrid vehicles**	The topic's aim is research in the field of simulation of electric and hybrid vehicles, especially of public transport and development of corresponding SW tools, which will enable, e.g., design of energy storage configuration on the vehicle and development of vehicle power management algorithms. The developed algorithms will be used in superior transport simulators and will enable to optimize energy management within the supply grid.	Electronics	KEV
36	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor Ing.Vojtěch Blahník, Ph.D.	**Smart grid and micro grid power converters**	The topic aims to research new topologies and control of power electronics converters used in smart grids and micro grids. The topic is focused on the cooperation of converters at smart grids, investigating both converter protection and grid protection during fault conditions. The goal is to utilize the advantages of power electronics converters also in the grids with mixed sources.	Electronics / Electrical Power Engineering	KEV
37	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor: Ing. Jakub Talla, Ph.D.	**Applications of artificial intelligence in electrical drives and power electronics**	The goal of this topic is research of artificial intelligence applications in electrical drives and power electronics. The main attention will be paid to deep neural networks (e.g., convolutional NN) and recurrent (e.g., LSTM) neural networks applied in control, states, and parameters identification of ac-drives and grid-connected power converters (e.g., to power distribution network).	Electronics	KEV
38	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor: Ing. Jakub Talla, Ph.D.	**Advanced control algorithms for switched reluctance motor drive**	This topic's goal is advanced control algorithm applications to electrical drive with switched reluctance motor (SRM). Specifically, the main attention will be paid to control without any rotor position sensor using active and passive methods, predictive control with maximal efficiency and maximal torque per ampere control (MTPA), and torque ripple reduction, etc.	Electronics	KEV
39	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor: Ing. Tomáš Košan, Ph.D.	**Accelerated Computations in Electric Drives and Power Electronics**	The topic's aim is research in hardware accelerators of selected parts of control algorithms and models of complete physical devices. Research can be divided into several topics, such as processing control algorithms using multi-core microcontroller and specialized computational accelerators, special computational accelerators realized in the field-programmable gate array (FPGA), and real-time modeling of drives using FPGA.	Electronics	KEV
40	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor: Ing. Martin Jára, Ph.D.	**New generation of low-voltage circuit brakers with power semiconductors**	This topic aims to research a new generation of low-voltage circuit breakers employing power electronics devices for the current interruption. In this application, the power semiconductor operates out of the safe operating area (SOA). Hence, the extensive experimental qualification of power electronics chips under the above mentioned hard operating conditions will be a part of this research. The use of the investigated device is being considered in the brand new generation DC HCB (protection of vehicles) as well as AC SSCB (residential) circuit breakers.	Electronics	KEV
41	prof. Ing. Zdeněk Peroutka, Ph.D. / assistant supervisor: Ing. Tomáš Košan, Ph.D.	**Control of Multilevel Converters**	The aim of this topic is to research the control of multi-level converters. The main attention will be paid to the design of new control algorithms (implemented mainly in multi-core microcontrollers (MCU) or field gate programmable arrays (FPGA) with focus on power capacitor balancing and/or shape/spectra of output current, optimization of number of necessary sensors, converter start-up / pre-charge, solutions of converter critical operating states, etc.	Electronics	KEV
42	doc. Ing. Martin Pittermann, Ph.D.	**Electric drive with double fed induction machin DFIM**	Control algorithms for a drive with DFIM (for the double-fed machine) suitable for topology with direct and indirect frequency converter. The application area is in the generator network, special generators, and motor mode. The aim is to develop and compare control algorithms for DFIG (double powered generator with slip-ring induction machine), their simulation, implementation into a control microcomputer, verification of the entire device (or model in the laboratory), and assessment of the realization of initial assumptions and other problems for real deployment in practice.	Electronics	KEV

43	doc. Ing. Martin Pittermann, Ph.D.	**Collaboration of traction substations**	Control algorithms for optimal collaboration of modern traction substations to minimize power losses and achieve satisfactory technical and economical energy consumption. The aim is to develop and compare control algorithms for TSS of a new generation (traction power station for 25kV / 50Hz catenary using power semiconductor converters), their simulation, implementation into a control microcomputer, verification of function (model of the whole device in the laboratory) and assessment of real achievement of initial assumptions and setting out other problems for real deployment in practice.	Electronics	KEV
44	doc. Ing. Martin Pittermann, Ph.D.	**Electric drive with frequency converter with minimized pasive components**	Problems of drive and drive control (including the effect on torque ripple and ASM efficiency) when using an extremely small DC-filter of an indirect frequency converter (i.e., minimized capacitance and inductance values in the DC link), when using special direct drive configurations (matrix converter, sparse matrix converter, etc.) and when using a direct frequency converter (modification of the cycloconverter in a simplified connection). The aim is to develop and compare power schemes and relevant control algorithms for a drive with frequency converter with minimized parameters of passive components (i.e., without large filter capacitor used in DC-link of today's converters), their simulation, implementation of algorithms in control microcomputer, verification of function on the model in the laboratory and assessment of the real achievement of initial assumptions and the setting of other problems for real deployment in practice.	Electronics	KEV
45	Ing. Josef Pihera, Ph.D.	**Diagnostics of partial discharges in AC and DC power systems**	The topic of the dissertation is the study and development of new diagnostic procedures and systems for evaluating the obtained data of partial discharges in AC and DC voltage systems. The main emphasis is placed on the diagnostics of parameters of partial discharges pulses of insulation systems operated in AC and DC supply systems, or their combination. The output of the dissertation will be new diagnostic and evaluation procedures suitable for evaluating the condition of AC and DC insulation systems.	Electrical Engineering	KET
46	Ing. Josef Pihera, Ph.D.	**Diagnosis of partial discharges at pulse voltage**	The topic of the dissertation is the study and development of new diagnostic methods and systems for evaluating the obtained data of partial discharges in systems powered by pulsed voltage. The main emphasis is on the development of new methods for the diagnosis of partial discharges of insulation systems operated at pulse voltage, or a combination of different voltages. The output of the dissertation will be new diagnostic and evaluation procedures suitable for evaluating the condition of insulation systems.	Electrical Engineering	KET
47	Ing. Josef Pihera, Ph.D.	**Diagnostic methods for monitoring the properties of conductive and semiconducting layers of the insulation system of rotating machines**	The topic of the dissertation is the study and development of diagnostic procedures for monitoring the condition of conductive and semiconducting layers of insulating systems of rotating machines. The main emphasis is placed on the diagnostics of electrical, thermal and mechanical parameters of the monitored systems and the mutual correlation of data. The output of the dissertation will be new diagnostic and evaluation procedures suitable for evaluating the condition of insulation systems.	Electrical Engineering	KET
48	doc. Ing. Radek Polanský, Ph.D. /Assistent supervisor Ing. Petr Kadlec, Ph.D.	**Electrical insulation systems with improved properties based on micro and nano additives**	The dissertation will focus on advanced electrical insulating composite materials based on a thermosetting or thermoplastic matrix and micro- and nano additives. Thermosetting composites are mainly used to produce electrical insulating systems of rotating and non-rotating machines, but they can also be part of emerging technologies related to high voltage direct current (HVDC) distribution. Thermoplastic electrical insulating composites are used mainly in the cable industry. Both groups of these materials are subject to ever-increasing demands regarding their useful properties, safety, lifetime, and reliability. One way to improve their properties is to transition from micro additives to nano additives and optimize homogenization methods and structuring composite materials, which should be addressed in the dissertation.	Electrical Engineering	KET
49	doc. Ing. Radek Polanský, Ph.D. /Assistent supervisor Ing. Pavel Prosr, Ph.D.	**Self-healing materials for electrical engineering**	The dissertation will focus on self-healing materials with potential for use in electrical engineering. These innovative materials can self-heal minor damage that may occur during their operational life. Adaptation of self-healing effect into materials for electrical engineering is a new issue in this area. Part of the dissertation will be to adapt currently used technologies to produce self-healing materials for electrical engineering, characterization of dielectric and structural properties of developed structures, long-term aging tests, etc.	Electrical Engineering	KET
50	doc. Ing. Radek Polanský, Ph.D. /Assistent supervisor doc. Ing. Tomáš Blecha, Ph.D.	**Electrical insulating composites with innovative functionalities**	The dissertation will focus on fiber-reinforced composites with electrical insulating properties, which, in addition to their basic functional properties, also provide other innovative functionalities enabling their in-situ diagnostics. Such materials can be created by incorporating various active and passive electrical components made using different conductive, semiconductive, and resistive yarn structures that have long been developed at the Department of Materials and Technology. Part of the dissertation will be the optimization of currently used technologies, development of new material structures and their characterization, long-term aging tests, etc.	Electrical Engineering	KET
51	doc. Ing. Radek Polanský, Ph.D. /Assistent supervisor Ing. Petr Kadlec, Ph.D.	**Perspective electrical insulating materials for additive manufacturing**	Additive manufacturing, especially 3D printing, is one of the fundamental parts of the Industry 4.0 concept. Even structural elements of complex geometric shapes with unique properties can be produced at relatively low costs with its help. Additive manufacturing could bring significant benefits also in the field of electrical insulation materials. The dissertation will aim to find suitable candidate materials for the additive manufacturing of electrical insulation structures, creating innovative processes for their production and characterization of mechanical, dielectric, and structural properties of input materials and manufactured structural elements.	Electrical Engineering	KET

52	doc. Ing. Radek Polanský, Ph.D. /Assistent supervisor Ing. Josef Pihera, Ph.D.	**Materials for conductive and semiconducting layers of the insulation system of rotating machines**	The dissertation topic will be the development of promising variants of materials for use in the form of conductive and semiconducting layers in the insulation systems of rotating machines. The focus will be on functional materials with controlled properties in terms of electrical, thermal, and mechanical parameters. The dissertation's output will be new or modified materials suitable for use in the technology of rotating machines.	Electrical Engineering	KET
53	doc. Ing. Bohumil Skala, Ph.D.	**Three-phase transformer operating with significant zero-sequence component**	The study will focus on a simulation model and calculation methodology for 3phase transformer design. The work will be focused on zero sequence component of 3phase core under unbalanced load. Particular care must be taken to a special design with respect to the magnetic flux zero sequence component, taking into account design aspects and core cooling. Force acting to a winding at short-circuit currents. Electric strength during surge (LI) test. Attention will also be paid to the parasitic effects arising in transformers, such as the frame of the magnetic circuit and the effect on the noise of the transformer.	Electrical Engineering	KEV
54	Ing. Radek Soukup, Ph.D.	**Flexible Electronics and Smart Textiles**	The aim of this work is research of new technologies, interconnection structures, electronic components and advanced functional blocks for flexible electronics and smart textiles. Part of the work is research of the advanced technology of permanent and separable interconnections and encapsulation for smart textiles.	Electronics	KET
55	doc. Ing. František Steiner, Ph.D.	**Diagnostics of components and substrates interconnection structures**	The dissertation thesis deals with the diagnostics of the influence of materials, technologies and environment on the reliability of conductive joints (contacts). It is the research of new materials, technologies, components and substrates. It includes the application of new diagnostic methods using modelling and simulation to diagnose these structures.	Electronics	KET
56	doc. Ing. František Steiner, Ph.D.	**Risk aspects of technological and diagnostic processes**	The topic of the dissertation thesis is focused on methods and tools of risk management. It includes determining suitability for use in technological and diagnostic processes. It is the research of new procedures, the proposal of the methodology and its verification using implemented risk management tool.	Electrical Engineering	KET
57	doc. Ing. Václav Šmídl, Ph.D. et Ph.D.	**Model identification in electrical engineering**	Mathematical models are being increasingly used to design electrical devices and their control algorithms. However, the model represents a real device only when its parameters are properly selected. In simple devices, the parameters can be directly measured, however this become problematic with increasing complexity of the device. For example, thermal networks have distributed parameters and many parameters of electrical machines depend on the operation state. Modern estimation methods can estimate parameters of non-linear models as well as models with missing measurements. The main objective of this work is to find a structure of the model, its uncertainty and measurement uncertainty that is suitable for application of estimation methods for a chosen device. Suitable devices are machines, converters and their components.	Electrical Engineering	KEV
58	doc. Ing. Václav Šmídl, Ph.D. et Ph.D.	**Neural networks in models for electrical engineering**	Classical approaches to design of model for electrical engineering build model from the first principles, such as the laws of physics. However, such approach typically requires knowledge of all system parameters with high accuracy. The classical neural networks allow to represent arbitrary function and thus model response of a system from large number of measurements, which is also impractical. Novel neural architectures are based on reduced expressive power that allows to estimate only a subset of functions (e.g. only those from arithmetical operations) which greatly reduce the number of required experiments. The aim of this work is to investigate the use of these architectures in selected applications, such as models of drives, power electronics or complex systems.	Electrical Engineering	KEV
59	doc. Ing. Pavel Trnka, Ph.D.	**Study of the space charge in composite dielectrics**	The scope of the doctoral thesis is the polarization mechanisms taking place in dielectric materials, their study, and description. The measurement and simulation of the electric field inside dielectric composites, measurement of space charge using the PEA method, measurement of the current responses in the time and frequency domain and depending on physical parameters, design of a suitable microstructure of composite with the aim to reduce space charge, parametric analysis and setting up principles of composite insulations for use in the high voltage technic concerning the formation of space charge.	Electrical Engineering	KET
60	doc. Ing. Pavel Trnka, Ph.D.	**Homogenization of electrical insulating structures**	The scope of the doctoral thesis is the research related to polarization phenomena in dielectrics, the study of the properties of selected dielectrics, and their use to create potential barriers in electrical equipment. In inhomogeneous dielectrics the barriers causing rearrangement of electric charge carriers and thus strong deformations of internal electric fields. The study of physical phenomena associated with polarization and the application of the knowledge should lead to the creation of new electrical insulating structures that can prevent the negative consequences that lead to the destruction of dielectrics in unpredictable places. The work should include the study of the interaction of macro heterogeneous systems with inhomogeneities at the interfaces of components, electric field deformation in the inhomogeneous dielectric, the formation of space charge, a description of causes of these phenomena, and proposals for elimination by changing the internal structure.	Electrical Engineering	KET

61	doc. Ing. Pavel Trnka, Ph.D.	**Methodology of data processing in the diagnostics of electrical machines**	The topic of the dissertation is a conceptual design of a system of work with diagnostic data obtained by a combination of online diagnostic systems and offline methods. Creating a system for data analysis, comparing the results of diagnostic surveys online and offline. Proposal of methodology for determining the final statement. Research related to this topic will include the study of multiparametric degradation processes taking place in various subsystems of electrical machines and their responses in online and offline diagnostic systems and its subsequential modeling.	Electrical Engineering	KET
62	doc. Ing. Pavel Trnka, Ph.D.	**Development of new electrical insulating liquids**	The aim of this dissertation is the design and development of electrical insulating liquids of the new generation. These fluids should not only meet the electrical requirements but also the requirements for environmental safety, sustainable development, and economic requirements. Besides, these fluids must demonstrate higher fire safety while maintaining appropriate viscosity and pour point. An integral part of the work is the study of other important parameters such as oxidation stability, incorporation of nanoparticles, etc.	Electrical Engineering	KET
63	doc. Ing. Pavel Trnka, Ph.D. /Assistent supervisor Ing. Josef Pihera, Ph.D.	**HVDC systems and device diagnostics**	The topic of the dissertation is the study and development of new diagnostic procedures and systems for evaluation of acquired data in electrical systems of AC and especially at DC voltage. The focus is on the diagnostics of insulation systems operated in AC and DC power systems or a combination of these. The result of the dissertation is the new diagnostic and evaluation procedures, which would be suitable for the evaluation of the AC and DC insulation systems conditions.	Electrical Engineering	KET
64	doc. Ing. Pavel Trnka, Ph.D. /Assistent supervisor Ing. Jaroslav Hornak, Ph.D.	**Advanced insulation materials for HVDC applications**	The aim of the work is the design and optimization of selected insulation systems concerning the maximum use of their properties in devices and elements used for the distribution and transmission of electricity. In addition to the optimization of insulation systems, the work will be focused on a comprehensive view of the issue of the long-term DC exposure, especially in terms of phenomenological and structural changes in selected insulation elements. For this purpose, laboratory experiments will be used, which should be correlated with numerical calculations.	Electrical Engineering	KET
65	Ing. Ivo Veřtát, Ph.D.	**Communication and navigation technologies for small satellites**	The topic of doctoral thesis is focused on the research of special communication and navigation technologies suitable for small satellites on low Earth orbits. Solution requires multi criteria optimizing in term of energetic requirements, interference immunity, capability of system adaptation, reliability in space environment and technical feasibility matching low mass and dimension limits. The research topic can also be focused on the development of the ground station and coordinated use of the ground station network during the satellite tracking and commanding. Doctoral student will be involved in the projects of Czech satellites VZLUSAT and PilsenCUBE, including the international activities in the area of CubeSat class satellite development.	Electronics	KEI