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SUMMARIES OF THE COURSES

for the master's program

«Efficient Electric Power Industry»

Educational direction

13.04.02 «Electric Power and Electrical Engineering»

«Energy Management»

Subject introduces students to the issues of energy saving in technological processes and at power transportation. Particular attention is paid to energy audit as a survey, allowing to determine potential of energy saving and to evaluate influence of industrial equipment on power quality. Students get a practice in using modern tools for energy audits, performing instrumental survey as well as learn to make a power consumption balance.

«Russian as a Foreign Language»

The discipline is intended for education of master's degree non-philological foreign students, who have the bachelor diploma of Russian institute of higher education and have the knowledge of Russian Language corresponding to the B 2 level. The program includes requirements for language knowledge level in different types of speech activity as well as grammar and speech material.

The mastering of this program will allow the foreign students to handle their communicative needs in educational, social and cultural sphere, will produce the base for successful learning of special subjects, and, as a result – for successful presentation of a thesis.

The Russian Language course for master's degree students must ensure the forming of a graduate's communicative competence on the level sufficient for professional activity in Russian Language. The education is realized on the source of general scientific, country-specific, literary, social and political texts.

«Foreign Language»

The purpose of the course «Foreign language» - training in practical knowledge of a foreign language (English, German, French), the criterion of which is the ability to use the most common language means in the main types of speech activity: speaking, listening, reading and writing. The aim of the course is to master the ability to maintain communication in most situations that may arise in everyday and professional activities. The structure of the course is divided into the following aspects (modules): speaking practice and listening, reading, writing practice, translation practice and practical grammar. Modules differ in topics and lexical composition of educational and informational materials. Systematic improvement of all four language skills and basic grammatical topics is provided.

«Social Communication in Professional Environment»

The main objective of the course is to develop the ability of students to critical analysis of specific communicative practices and situations of interpersonal interaction and also management skills of communicative behavior in the business interaction. Specific topics are focused on basic communication skills in a business environment, techniques of group management and of making group decisions, the rules of business written communication and business telephone communication.

«History of Science and Technology in the Field of Technical System»

The course is devoted to the study of a new physical phenomena discovery, new scientific theories and laws forming, basic ideas and technical solutions appearance in the field of electrical engineering, electro mechanics and control, which formed the automatic control science. Main stages in the history of the control theory and technology are overviewed. The discipline includes also the acquaintance with the history of St. Petersburg Electrotechnical University “LETI” and its main scientific schools.

«Energy Saving and Quality of Electric Energy in Power Systems»

Subject introduces students to the issues of energy saving in technological processes and at power transportation. Particular attention is paid to energy audit as a survey, allowing to determine potential of energy saving and to evaluate influence of industrial equipment on power quality. Students get a practice in using modern tools for energy audits, performing instrumental survey as well as learn to make a power consumption balance.

«Information Support in the Electric Power Industry»

Information support in electric power industry is considered, namely: classification, purpose, information support primary elements. Students learn databases, as an information system bottom. In the course of discipline are acquainted with information displays.

«Power Converters»

Calculation and design of the modern transforming devices on the basis of force electronic semiconductor elements is considered, namely: classification, assignment, main circuitry solutions of devices of force electronics; force semiconductor items and transformers as controls operation modes, protection and regulations of parameters of electrotechnical and electrical power systems; the physical phenomena in semiconductor items and bases of the theory of semiconductor items; principle of operation of the modern force semiconductor items, features of their construction; design methods, tests and simulations of force transforming devices.

«Alternative Energy»

The discipline introduces students to the functioning and use of alternative energy sources. The current state, examples of implementation and prospects of using wind, solar, geothermal waters, secondary energy resources, fuel cells and other alternative energy sources in Russia and abroad are considered.

«Efficient Industrial Installations»

The discipline introduces students to the issues of the use of electric heating in the industry; with technologies and devices for heating, heat treatment and metal melting; with structural materials used in design and features of heating and melting units for ferrous and non-ferrous metals.

«Systems of Ensuring the Safety for Technical Control Devices»

Discipline is devoted to study the general technical aspects of complex safety, which contain concept, principles of design and construction, which can be used for all technical control systems. Primary attention is paid to the requirements for the tests according to the standards of safety at the all stages of the life cycle. Special features of control systems are examined from the potential danger point of view, created by electric current, fire and explosion, electromagnetic fields, mechanical, climatic actions and human factors.

«Renewable Energy Automation Stations»

Account and engineering of the modern stations of renewable energy is considered, namely: classification, purpose, the basic circuitry decisions of devices of solar stations; power semiconductor devices and reformers, as controls operation modes, protections and adjustments of arguments; charge control units; charge batteries; design techniques, testing and simulations of stations of renewable energy.

«Intelligent Control Systems for Renewable Energy Stations»

Engineering of intellectual guidance systems by stations of renewable energy is considered, namely: classification, purpose, the basic circuitry decisions of devices of intellectual guidance systems of stations of renewable energy; controls operation modes, protections and adjustments of arguments.

«Modeling of Processes in Power Industry»

The discipline introduces students to methods of solving problems of mathematical physics. For the equations of thermal and electromagnetic fields are shown all stages of the problem solution, starting from the choice of solution method and ending with the creation of the program in algorithmic language. Considers the finite differential and finite element methods for solving differential equations. Also provides analytical and combined methods of solutions. Discusses the solution of inverse problems. On using the commercial package ANSYS provides a solution to problems of electromagnetic field and thermal conductivity for two-dimensional and three-dimensional case.

«Modeling and Synthesis of Nonlinear Elements of Systems»

The discipline introduces the basis of mathematical modeling and synthesis of nonlinear devices at the input/output mapping. Different forms of nonlinear models classified as multidimensional polynomials, regression models and neural networks are investigated. The comparative analysis of nonlinear models is performed. The methods and algorithms of model building by solving the problems of nonlinear device operator approximation in the root mean square norm, using the input and output signal sets are studied. The approximation problems are solved in time-, frequency-, s- and z-domain. The skills of various neural network synthesis in MATLAB are given. The examples of modeling and synthesis of nonlinear transformers, filters, compensators are represented.

«Mathematical Modeling of Objects and Automatic Control Systems»

The discipline includes physical and mathematical bases of construction of models of objects and management systems, methodology of their research, the principles of creation and research models in interactive engineering software environments.

«Academic Internship (Introductory Internship)»

«Internship (Research Project)»

«Internship (Internship Project)»

«Internship (Pre-degree Internship)»

«State Final Examination»

The State final attestation includes defense of the graduation qualification work. The State final attestation is the last mastering stage of the basic educational program.

The training level of graduates for performance of their professional tasks and compliance of their training with the requirements of the State Standard are assessed in the course of the State final attestation.

«Methods and Means of Mathematical Optimization in the Field of Technical Systems»

The discipline introduces the basics of optimization theory and decision making. Models and decision-making methods, methods and algorithms of mathematical programming, various approaches used for modeling and control in optimal systems are considered. Within the framework of the course, theoretical conclusions are considered on the basis of examples of real systems, namely: the use of linear programming for resource allocation in the planning of the production life cycle, the problem of balancing the assembly at the factory, queue problems in service systems, Markov chains in game theory, the use of filtering when direct measurements are not possible, for the case of a thermometer

«Robotics System Design»

The discipline introduces the basics of using of single board computer such as Raspberry Pi and ROS systems. Within the framework of the course, theoretical background for working with SBC and ROS is given on the basis of examples of real systems. The use of ROS with Raspberry Pi as a part of practical workshop is given.