



FACULTY OF POWER AND ELECTRICAL ENGINEERING

Please note! This is a preliminary list of courses for the study year 2016/2017. Changes may occur!

SPRING 2017 **BACHELOR COURSES**

EEI481 Programming Technologies in Industrial Electronics

3.00 CP (4.50 ECTS)

Classification of information systems. Intelligent systems of industrial electronics. Object-oriented design. Tasks of the intelligent systems. Solving algorithms. Technology of software design. Life cycle. Flowcharting of the programs. Structure analysis. Synthesis of the programs. Method of Jackson. Testing of software. Testing of basis way. Testing of conditions. Testing of data flux. Testing of cycles. Visual modeling. Object-oriented testing.

EEE215 Theory of Circuits

5.00 CP (7.5 ECTS)

Transient processes in the linear electrical circuits, long lines and non-linear circuits. Methods of analysis and numerical calculation of non-periodical currents and transient processes in linear circuits. Steady state and transient processes.

EEP344 Power Electronics

3.00 CP (4.50 ECTS)

The course deals with power electronic converters and their elements. The most important objects of the course are: general definitions and mathematical tools of power electronics, one-cycle and multi-cycle DC/DC converters, diode and thyristor rectifiers, autonomous inverters and some specific converters.

The course is concentrated on calculation of parameters of the power converters, choice of their passive elements and semiconductor switches, as well as on the cooling and protection of these switches. The course includes special lectures devoted to development of the power converter utilizing the corresponding modern integrated circuits. The practical part of the course includes numerically solved exercises, exercises of simulation of the power converters, laboratory exercises. The most active students are provided with opportunity to design, build and test one of the studied power converters utilizing one of the available integrated circuits.

EEM305 Electrical Machines

5.00 CP (7.5 ECTS)

This subject includes such topics as constructions of electrical machines and transformers, theoretical issues of stationary and transient processes, as well as analysis of operation regimes and maintenance aspects.

EEI352 Programming languages

3.00 CP (4.50 ECTS)

Features of programming in electric technologies. Basics of languages Pascal, C and C++. Simple program in the language C++. C++ programs development and .running. Necessary regulations for program C++ running. Construction of classes. Members of classes. Indices of classes. Work with classes. Constructors and destructors. Defining of parameters for constructors. Overloading operators. Meaning of initialising. Control, constructors and destructors in industrial electronics structure and loading. Necessary provisions for C++ programme loading. Designing of classes. Class members. Class pointers.

EEP273 Basics of Regulation Theory

2.00 CP (3.00 ECTS)

The regulation tasks in analog electrical engineering systems. Feed-back loops, typical junctions, its characteristics, modeling, transient to the frequency characteristics. Estimation of stability. Closed-loop systems. Transient processes. Improving of quality indicators. Regulators. Analogue and numerical simulation. Numerical control.

RTR207 Computerization of Mathematical Tasks in Electrical Engineering

3.00 CP (4.50 ECTS)

Symbolic and numerical technical computing in electronics and telecommunications context. Technical computing and programming in MATLAB (ML). Programming, matrix computing, numerical solving of linear, nonlinear and ordinary differential equations using ML. Approximation, interpolation, numerical integration, and numerical solving of simple differential equations using ML.

RTR223 Electrical Engineering Theory

6.00 CP (9.00 ECTS)

Circuits elements, parameters and fundamental laws: current, voltage, resistance, power, energy, ideally linear elements R, L, C, ideal and real current and voltage sources, Ohm's and Kirchoff's laws. Resistive circuits, their analysis methods: current and voltage division rule, Thevenin, Norton and superposition theorems. Sinusoidal steady state theory and analysis in frequency domain: complex impedance and admittance, phasors and phasor diagrams. Magnetically coupled circuits. Resonances in RLC series and parallel circuits. Three-phase power systems analysis.

MASTER COURSES

EEP574 Commutated Converters Part 1 and Part 2 (graduate)

5.00 CP (7.50 ECTS)

The subject provides in-depth knowledge in microeconomics and macroeconomics. Particular attention is paid to a deeper understanding of demand and supply, consumer choice and public choice theories. The types of economic development policy and economic development problems under conditions of globalization and international integration are analysed.

EEP408 Automated Electrotechnological Processes (graduate)

2.00 CP (3.00 ECTS)

The subject is meant for full and part-time study, the type of RTU students of bachelor study program "Computer control of electrical technologies". Subject examines the process automation system for the establishment of principles. Deals with electrical heating installations, induction heating equipment, welding equipment and electrogalvanic plant automation systems modeling.

EEP458 Typical Electrical Drive (graduate)

5.00 CP (7.50 ECTS)

The realization of typical electric drives for different essential groups of mechanisms: cranes, lifts, conveyers, pumps, compressors, fans, excavators and machine-tools. Calculation of the drives. The dynamic loads, transient processes. Braking processes. Adjusting of efficiency of the mechanisms, modes of automation systems and schemes for control of typical electrical drives

EEP504 Microprocessors - based Automation Systems (graduate)

3.00 CP (4.5 ECTS)

The course has been composed for any student who has elementary knowledge in the field of electrical engineering and programming and wish to gain basic practical skills of utilization of microcontrollers MSP430. The course briefly discusses basic design features of microcontrollers MSP430 in the context of various architectures of microprocessors, microcontrollers and peripheral devices. The most significant part of the course is devoted to the programming of MSP430 – including the programming of digital I/O, watchdog and arithmetical operations. The course is based on practical studies and assumes active individual training of the students in the laboratory or at home.

EEP584 Theory of Electronic Converters of Electrical Energy (graduate)

4.00 CP (6.00 ECTS)

General theory of energy conversion. Rectifiers and line-frequency controlled inverters. Autonomous inverters. Current-source, voltage-source and resonance mode inverters. Modulation methods. BUCK and BOOST converters. Frequency converters with high-frequency links. Matrix type converters. Cycloconverters.

EEP585 Simulation of Electrical Processes (*graduate*)

5.00 CP (7.50 ECTS)

The subject is devoted to simulation of electrical circuits. Principles of composing of differential equation systems for electrical equipment, of their numerical calculation, and its features in MATLAB are given in the first significant part of the course. The second part is devoted to PSPICE circuit description language and to the features of its practical utilization. The theoretical part of the course deals with solutions of ordinary differential equation systems and basics principles of PSPICE. The practical (most important) part of the course includes various examples of simulation of electrical equipment.

EEP345 Unconventional Systems of Energy Conversion and Accumulation (*graduate*)

3.00 CP (4.50 ECTS)

Wind power stations, turbines, adjusting, connections to the Main, small power hydraulic plants, its adjusting, electric machines of the special construction, photovoltaics, piezo generators, piezo motors, motion and movement sensors, low voltage inverters, adjusting, regulation, batteries, UPS.

EEP582 Control Technique with Microprocessor Controllers (*graduate*)

3.00 CP (4.5 ECTS)

Process control systems with one and two tanks of capacities. Control loops. Industrial measurement equipment for flow, pressure, level and temperature. Controlled valves, programmable controllers, functions, P, PI, PID control loops, optimal setting techniques.

EEP524 Design of Power Electronics Systems (*graduate*)

3.00 CP (4.5 ECTS)

The subject is proposed for full and part-time RTU academic master study program „Computerized Control of Electrical Technologies” students. The power electronics system main converter design and calculation are considered. It is described the design and calculation of controllable rectifier, net inverter, DC pulse converter and autonomous inverter power and control schemes.

EEP570 Elements of Automatics (*graduate*)

9.00 CP (13.5 ECTS)

Sensors for measurement of electrical and non-electric parameters. Measurements schemes. Synthesis of logical parts of measurement schemes. Functional converters. Characteristics of technical parameters. Indicators of reliability level of the schemes.

EEP572 The Control Systems of Power Electronics Equipment (*graduate*)

5.00 CP (7.50 ECTS)

Electronic elements of control systems. Saw-teeth mode voltage, forming of firing pulses. Achieving of the time delay in control systems, phase shifting control, synchronization with network, generators for clock pulses, diversification devices, Pulse Width Modulators, microprocessor based control systems for frequency converters.

EEP583 Industrial Frequency Converters and Inverters (*graduate*)

2.00 CP (3.00 ECTS)

Historical overview of AC drive systems development. Mechanical and electrical characteristics of DC and AC drive systems with different speed control methods. Variable frequency AC drives, typical applications and characteristics. Inverters and frequency converters with pulse width modulation techniques. Scalar and vector-oriented control methods of frequency converters.