



FACULTY OF POWER AND ELECTRICAL ENGINEERING

Please note! This is a preliminary list of courses. Changes may occur!

SPRING SEMESTER BACHELOR COURSES

For students in power and electrical engineering study programmes

EEM208 Computerization of Mathematical Tasks in Electrical Engineering 3.00 CP (4.5 ECTS)

Electrotechnical tasks for numerical methods and their features. Main algorithms of numerical methods for systems of equations, non-linear equations and differential equations. Numerical methods of differentiation and integration.

EES263 Basics of Electric Power Engineering

3.00 CP (4.5 ECTS)

World's electrical power engineering. Energy production and transmission. Alternative power engineering development. Environmental problems of power engineering. Possibility to minimize ecological influence of power engineering. Electrical power systems, protection of system elements. Power system control during normal and emergency conditions. Communications in the power system. Improvement of energy consumption effectiveness taking into consideration economical and environmental means.

EEl481 Programming Technologies in Industrial Electronics

3.00 CP (4.5 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.

EEl354 Adaptive Systems in Industrial Electronics

3.00 CP (4.5 ECTS)

Adaptive systems are the systems that automatically adjust themselves to outside conditions and changes of electric or electro-mechanic control object, changing structure and parameters of control device providing necessary quality of control. The main features of the adaptive system are the possibilities for self-organization, self-learning and self-regulation with the use of expert systems, fuzzy logic, associative memory, neural networks and other methods, solving the tasks of extreme control and optimization, automation control as well as searching, recognition, classification, clusterization tasks.

EEl710 Theory of Electrical Drive Systems

5.00 CP (7.5 ECTS)

Electro-mechanical transmission of electric energy The principle of construction of the electric machines and the theoretic questions of the operation in stationary and transient regimes are considered, the properties of the machines operation regimes and maintaining and application are analyzed. Elements of electric drives, mechanics, equation of motion. Characteristics of actuating mechanisms. The systems of electric drives speed regulation and control with the power electronic converters, regulation characteristics. Transient processes and power engineering questions. Control methods of electric drives.

EEP344 Power Electronics

3.00 CP (4.5 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.

EEP475 Electronic Equipment

4.00 CP (6.0 ECTS)

Typical power supply unit topologies of electronic equipment. Linear and switching mode voltage regulators - principles of operation and common integrated circuits. Overcurrent protection circuits. Power amplifiers, their classification and the main characteristics. The structure and basic properties of operational amplifiers. Typical operational amplifier circuits, signal generators and active filters. Logic gates and their manipulation. Typical combinational logic – decoders, encoders, multiplexers, adders, programmable logic devices. Typical sequential logic – triggers, binary counters, parallel and shift registers. Semiconductor ROM and RAM memories, their structure and parameters. Integrated logic circuit families - DTL, TTL, CMOS, BiCMOS, ECL, GaAs devices, their structure and parameters. ADCs and DACs. Converters „voltage – frequency” and „frequency – voltage”. Timer circuits and applications

MASTER COURSES

For students in power and electrical engineering study programmes

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

3.00 CP (4.5 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.

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

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.

EEP574 Commutated Converters Part 1 and Part 2 (*graduate*)

5.00 CP (7.50 ECTS)

Transistor switches, control drivers, thyristors switches, control schemes, forming of transient process, commutation of DC, DC-pulse regulators, current-source and voltage-source inverters, control systems, action with electrical motors, programmable numerical control.

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.

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.

For students in environmental study programmes

EVA706 Ecodesign an Life Cycle Analysis (*graduate*)

5.0 (7.5 ECTS)

The aim of the study course is to introduce life cycle approach and thinking which is necessary in the process of product design. The course covers main principles of ecodesign. Guidelines of ecodesign which allow to consider and reduce the factors of environmental impact arising during life cycle of products are reviewed in the course. Qualitative and quantitative methods for estimation of environmental impact created by product systems as well as comparison and estimation of environmental performance caused by various design solutions of the products are taught.

EVA708 Energy Efficiency and Energy Audit of Buildings (*graduate*)

4.0 (6.0 ECTS)

During study course „ Building energy efficiency” students are faced with problems related to building energy efficiency. During this study course students are learning the basics of building energy consumption calculations and data analysis methods, which gives a possibility to compare different buildings. Great attention is paid to building energy efficiency improvement possibilities by using new technological solutions for building renovation and by using advanced building management systems. Also energy efficiency possibilities during building design phase are studied in this course.

EAS704 Socio-economic aspects of energy supply (*graduate*)

4.0 (6.0 ECTS)

Concept of socio-economic aspects of energy supply systems. Techno-economic, socio-economic and environmental aspects of energy supply; the current situation, trends and projections at the global, EU and Latvian context. Investment project cycles. Public regulation of energy supply. Basic aspects of pre-investment study. Market institutions and technological change, its impact on the technical and economic studies; the entrance and exit barriers. Content of the technical-economic study. The basic principles of calculation of capital investments, financial analysis of energy project and investment analysis. Calculation of long-term marginal cost of electricity production. Activities of the energy supply companies in a competitive environment. The external costs in economic calculation. Socio-economic figures for energy projects.

EAS723 Renewable energy sources (*graduate*)

4.0 (6.0 ECTS)

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Renewable energy flow; solar, wind, hydro, ocean waves, tide, geothermal and bio-fuel energy systems. Energy storage and distribution. Integration of renewable energy sources into the energy systems. Planning of energy supply scenarios with increased share of renewables.