RIGA TECHNICAL UNIVERSITY

Faculty of Electrical and Environmental Engineering

AUTUMN SEMESTER - BACHELOR COURSES

Full course description available by clicking on the course code

Study programme "Electrical engineering"

NOTE! THIS IS A PRELIMINARY LIST OF COURSES. CHANGES MAY OCCUR!

Code	Course name	CP	ECTS
EEP475	**Electronic Equipment**	**4.0 CP**	**6.0 ECTS**
The study course gives an insight on typical electronic power supply unit topologies. Linear and switching mode voltage regulators are discussed analysing the principles of operation and common integrated circuits. Overcurrent protection circuits are discussed. Power amplifiers, their classification, as well as their main characteristics are analysed. The structure and basic properties of operational amplifiers are discussed. The typical operational amplifier circuits, signal generators and active filters are analysed. Basic logic functions, logic gates and their properties are discussed. Typical combinational logic devices – decoders, encoders, multiplexers, adders, programmable logic devices, as well as the typical sequential logic devices – triggers, binary counters, parallel and shift registers are covered. Semiconductor ROM and RAM memories, their structure and parameters are discussed. Integrated logic circuit families - DTL, TTL, CMOS, BiCMOS, ECL, GaAs devices, their structure and parameters are analyzed and the good practice while working with digital devices is discussed. Various devices linking the digital and analog circuitry are covered - ADCs and DACs, „voltage – frequency" and „frequency – voltage" converters as well as timer circuits and applications.			
BŪK702	**Adaptive Systems in Biology**	**3.0 CP**	**4.5 ECTS**
The aim of the study course is to provide knowledge about the adaptive mechanisms in biology, their types and importance in control of biological processes. Study course tasks: 1. To provide basic knowledge in the following fields of biology - biochemistry, molecular biology, cell biology, evolution, ecology, and microbiology. 2. To create theoretical and practical knowledge about the mechanisms of process control in biological systems. 3. To promote the integration of biological processes in other sectors. 4. Explain the importance of biological processes in human life and exploitation potential.			
EEE223	**Fundamentals of Electrical Engineering Theory**	**6.0 CP**	**9.0 ECTS**
The aim of the study course is to provide the necessary knowledge and develop an understanding of electromagnetic phenomena and processes found in linear electrical circuits in stationary modes, as well as to provide knowledge about qualitative and quantitative relationships. The tasks of the study course are: 1) to present current, voltage and power calculations in DC and AC circuits (single-phase and three-phase); 2) to provide knowledge on how to represent sinusoidal currents and voltages in a complex plane in the form of vector diagrams, to create a potential topographic diagram of AC circuit points; 3) to introduce resonance and mutual induction phenomena; 4) to present the undesirable effects of higher harmonics on the operating modes of AC circuits and the operation of resonant filters, with the help of which their influence can be reduced.			
EEI717	**Embedded Systems (course project)**	**2.0 CP**	**3.0 ECTS**
Utilization of embedded microprocessor systems often includes acquisition of various data from sensors and their networks, as well as process control. The proposed course develops practical hardware and software skills related to sensor's use and process control.			
EEI345	**Programming Technologies (study project)**	**3.0 CP**	**4.5 ECTS**
The goal of the study course is to train to develop individually selected embedded software system and to solve the assigned technical task related to the control of electrical objects. The tasks of the study course are: 1) to provide knowledge about the design of embedded software project technical documentation; 2) to develop skills to perform system analysis, requirements analysis, structural analysis and algorithm development; 3) to improve programming skills; 4) to evolve competence to create and test the program according to the developed project and defined requirements.			

EEP273	Basics of Regulation Theory	2.0 CP	3.0 ECTS
In the study course the methods of regulation theory are acquired and the skills of parameter calculations are acquired. The essence of the study course is related to the regulation of the parameters of the technical object, according to a certain level, moreover, the object must be able to adjust the value of the output parameter, according to the control signal. In most cases, these control signals are generated based on information about the current parameter values of the object. Control process design skills in basic automatic control processes are acquired. Students acquire the skills of solving analogy electrical engineering object regulation tasks. Feedback calculation, system decompositions - division into stages, as well as stage characteristics, creation of their models and transition to frequency characteristics. Students evaluate the system parameters - the system stability assessment. The design of control circuits for closed systems is considered. Thus, the transition processes of systems, their quality improvement, parameters of regulators, analogy and numerical modeling are performed. Examples of the application of numerical control are considered.			

EEM305	Electrical Machines	5.0 CP	7.5 ECTS
The study course covers the principles and constructions of electrical machines and transformers, theoretical issues in stationary and transient processes are considered, as well as their operating modes and operating properties are analysed. Objective of the study course is to acquaint with the process of electromechanical energy transformation in various types of electrical machines and transformers. Tasks of the study course are to develop and improve knowledge and skills in the calculation and operation of electric machines.			

EEI344	Digital Electronics (Study Project)	2.0 CP	3.0 ECTS
In this study course such topics as number systems, logic functions, analysis and design of combinational logic circuits, analysis and design of counter circuits, programmable logic and digital logic description languages are discussed. he goal of the study course is to give students knowledge about control system design using digital electronic circuits. Study course objectives are: 1. To teach how to use typical discrete logic elements for combinational and sequential circuit synthesis. 2. To teach how to synthesize logic circuits using programmable logic. 3. To teach how to practically use typical logic elements and programmable.			

EEP203	Digital Electronics (basic level)	4.0 CP	6.0 ECTS
in the study course such topics as digital quantities, number systems, logic functions, Boolean algebra and laws, Karnaugh map, analysis and design of combinational logic circuits, fixed function logic circuits, programmable logic and its description methods are discussed.			

EEI718	Industrial Sensors and Actuators	4.0 CP	6.0 ECTS
The study course focuses on industrial sensors and actuators. The working principles, terminology and classification of common industrial sensors are analysed. The electrical and pneumatic actuators are mainly discussed but some information is given also about hydraulic actuators. The typical solutions for connecting the sensors and actuators to the control equipment are explained.			

AUTUMN SEMESTER - BACHELOR COURSES

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Study programme "Environmental engineering"

NOTE! THIS IS A PRELIMINARY LIST OF COURSES. CHANGES MAY OCCUR!

Code	Course name	CP	ECTS
VAS003	Introduction to Environmental Research Methods and Theory	4.0 CP	6.0 ECTS
The aim of the course is to give students an idea of the basic principles of scientific research. Lectures and workshops cover a range of issues ranging from philosophical insight into science and its role in society, formulation of hypotheses and planning of experiments, to statistical processing of data, proper reading and perception of scientific publications, and their preparation. The course also includes a brief overview of the instrumental and biological environmental analysis methods used in environmental studies.			

VAS004	Concepts and Technologies of Waste Management (2)	3.0 CP	4.5 ECTS
The study course consists of two parts. The first part is based on the sustainable waste management concept and is focused on the minimisation of amounts of produced and disposed wastes for the elimination of environmental pollution and useless consumption of resources. Different methods of pre-treatment and treatment wastes are studied and optimisation of waste management for environmental pollution prevention/ elimination and economic profitability is modelled during the study course. The second part of the study course will introduce different geophysical methods which are applicable solely or in combination, to solve engineering and environmental problems. The mathematical fundamentals will be explained shortly for each method as it is necessary for an understanding of the results. The description of each method includes descriptions of the equipment, the mathematical basis for obtaining the results, measurement methods and algorithms, determination of accuracy, economic and social aspects, interpretation and analysis of the processed measurement results.			

VAS005	Introduction to Environmental System Dynamics Modeling	5.0 CP	7.5 ECTS
The study course provides a basic knowledge of the use of system dynamics modelling for solving environmental problems. The study course is based on the basic principles of systemic thinking and the use of simple graphical tools for system design and analysis, stock and flow structure design, dynamic behaviour models, nonlinearity, delays and basic modelling principles in modelling environments. The study course consists of lectures and practical works.			

DIM708	Environmental Mathematics (part 1)	4.0 CP	6.0 ECTS
The study course provides knowledge of the mathematical nature of environmental and climate-related processes, possible solutions and a comprehensive analysis of them.			

MFT703	Physics (part 1)	4.0 CP	6.0 ECTS
Physics gathers facts and knowledge about all processes in the ambient, at all levels of matter, from atomic and elemental particle world to the universe as a whole, using a common system of physical characteristics and fundamental laws of nature. In physics mathematical models of real processes and objects are created which describe the properties of the studied objects (processes) with numerical values of certain physical quantities. The physics course is the fundamental basis.			

AUTUMN SEMESTER - MASTER COURSES

Full course description available by clicking on the course code

Study programme "Electrical engineering"

(Available only to graduate students)

NOTE! THIS IS A PRELIMINARY LIST OF COURSES. CHANGES MAY OCCUR!

Code	Course name	CP	ECTS
EEP504	Microprocessors - based Automation Systems	3.0 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.			

EEP585	Simulation of Electrical Processes	5.0 CP	7.5 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.			

EEP433	Automated Electrical Drive	3.0 CP	4.5 ECTS
Electrical drives and automation by usage of the DC, AC induction and synchronous type motors. Tracking drives, programmable, adaptive and self-organizing systems. Electric magnets, electric-magnetic clutches. Choice of the motors and its protection. Reliability of the systems.			

EEP584	Theory of Electronic Converters of Electrical Energy	4.0 CP	6.0 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.			

EEI701	Effective Lighting	2.0 CP	3.0 ECTS
The course is focused on lighting issues. The course summarizes the current lighting and electrical systems, as well as explains their operating principle as well as the basic methods of the modern systems of the lighting control and regulation. One of the most important questions connected with the energy saving from the modern lighting systems.			

EEA432	Electrical Installation of Buildings	2.0 CP	3.0 ECTS
Structure of buildings and their construction. Schemes of electric installation and systems of conventional signs. Electrical equipment in household and its control. Selection of electrical devices and mountingtechnology. Tools and devices for mounting. How to draw up a plan of installation.			

EEP524	Design of Power Electronics Systems	3.0 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 desribed the design and calculation of controllable rectifier, net inverter, DC pulse converter and autonomous inverter power and control schemes.			

EEP570	Elements of Automatics	9.0 CP	13.5 ECTS
Within the study course, the main stages of the automation process are considered, the design of an individual prototype is performed, the corresponding calculation and selection of elements is performed. Sensors of electrical and non-electrical quantities, signal measurement circuits are studied. During the study course, the synthesis of the logical part is performed. Schemes and application of functional converters, characteristics of their technical parameters as well as the analysis of the reliability indicators of the schemes are studied is performed.			

EEP572	The Control Systems of Power Electronics Equipment	5.0 CP	7.5 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.			