RIGA TECHNICAL UNIVERSITY

FACULTY OF ELECTRONICS AND TELECOMMUNICATIONS

Please note! This is a preliminary list of courses for the study year 2017/2018. Changes may occur!

Spring 2018

BACHELOR COURSES

RTR108 Computer Studies (special course)
2.00 CP (3.00 ECTS)
The course provides further insights into contemporary computers and computing algorithms to be applied in further studies and engineering work, the basics of which were acquired within the framework of the course Computer Studies (basic course) taught during the first semester at RTU FET bachelor programme. The course outlines general data acquisition, computing and representation methods, related to potential automatization of these processes, using Internet recourses (telecommunication channels and Internet sites). Students get acquainted with Python programming language, study HTML elements presenting the data, and XML elements structuring the data. Within the framework of the course the students create electronic documents with the help of document production system LaTex. C++ and Python programming language object oriented programming elements are studied. The working computer environment is Linux based operational system like SUSE and/or UBUNTU.
Practical programming tasks are connected with the special requirements imposed by the study field of electronics and telecommunications.

RRE102 Electricity and Magnetism
2.00 CP (3.00 ECTS)
Electrical charges and electrical field; foundations of relativity, origin of magnetism. Capacity, inductivity and mutual inductivity. Interaction of electrical and magnetic fields, Maxwell's equations. Propogation of electromagnetic waves and energy, skin-effect. Electric and magnetic properties of matters, superconductivity, ferromagnetism.

REA204 Electron Devices
3.00 CP (4.50 ECTS)
Electron devices as two and four terminal devices, their current-voltage characteristics. Small signal parameters of two and four terminal devices and corresponding equivalent circuits. Electron energy spectrum of solids, their division in metals, dielectrics and semiconductors. Intrinsic semiconductors and semiconductors with impurities. Electron statistics in semiconductors. P-n junction, its equilibrium and non-equilibrium properties. Heterojunction and contact metal-semiconductor. Rectifier, p-i-n, high frequency, pulse, tunnel, reverse, Zener, variable capacitance and Schottky diodes. Bipolar junction transistors, thyristors, field effect transistors and charge coupled devices. Structure, operation principles, current-voltage characteristics, parameters, mathematical models, advantages and drawbacks of devices considered. Influence of temperature on operation of electron devices.

REA202 Electrical Measurements
3.00 CP (4.50 ECTS)
Introduction into foundations of measurement. Energy parameters of signals. Signal time parameter measurement. Measurement of shape and spectrum of signals. Concentrated and distributed parameter circuits. Measurement of non-electrical values. Fundamentals of Metrology. Automatization of measurement process.

RDE302 Transmission Media
6.00 CP (9.0 ECTS)
Communication line design. Classification of cable, insulating materials, protective covers. Electromagnetic processes in symmetrical, coaxial cable, waveguides. Design optimization. Electromagnetic compatibility. Mutual influence, rationing, protection. Shielding theory. Corrosion. Line construction, design, operation. The course includes both theory and communication lines measurements in the laboratory study. The international standards relating to the use of communication lines have been dealt with. Students are prepared both for practical work with lines of communication, and further studies in Master Course.

RDE303 Transmission Systems
4.00 CP (6.0 ECTS)
This course deals with transmission systems (TS), their evolution and application in modern telecommunications networks. Topics include signal digitalisation and transmission, regeneration of a digital signal and its conversion back to the analogue form. Formation and multiplexing of digital streams, as well as network synchronisation are examined. The course covers the theory of TS, as well as practical measurements in the laboratory. International standards related to TS interfaces are considered. Students are prepared for professional career and further studies at the Master's level.

RAE306 Digital Switching Systems
4.00 CP (6.0 ECTS)
Introduction to telecommunication systems and services. Basics of digital circuit switching, time and space switches. Digital networks: component and multiplexing systems, main types of lines and trunks. Digital switching systems: comparison of EWSD and S12. Basics of packet switching and transmission. Difference between circuit and packet switching. Open system interface. ATM. Compromise between circuit and packet switching.

RAE305 Teletraffic Theory
3.00 CP (4.50 ECTS)
The course gives knowledge and skills of modelling, analysis and simulation of telecommunication networks as mass service systems. Dealing with M/M/1, M/M/k systems analytically. The use of Markov chains as mathematical models. Acquiring skills in simulation of systems with Petrie nets and other simple simulating tools (Java Simulation TOOLS).

RAE361 Digital Devices of Telecommunications Systems
3.00 CP (4.50 ECTS)
Addressing modes in processor systems. Systems of commands of one-byte microprocessors and programming basics. Floating comma number formatting and the subprocessor. External memory and its addressing and protection. Pipeline processing commands and the data. Alarm processors, their use.

RDE301 Telecommunications Theory
5.00 CP (7.50 ECTS)
The aim of electro-communications theory is to provide students with the basic knowledge of principles, structure and operation of communication systems. The following questions are covered: the history of telecommunication systems, their development, classification; signal and noise as random processes; geometrical interpretation of signals; sampling theorem, discretization of continuous signals; modulation and detection; the models of communication channels, information theory; codes, their classification and application; Shannon's theorems, theory of optimal reception of digital and continuous signals; signal filtering. Laboratory work and practical work are also envisaged.

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.

RTR215 Circuit Theory
5.00 CP (7.50 ECTS)
Transient analysis of electric circuits. First order circuits. Second order circuits. State variable analysis. Discrete-time convolution. Continuous-time convolution. Convolution algebra. Laplace transforms. Transfer function. Bode plots. Two-port networks. Two-port parameters. Two-port interconnections. Introduction into electric filter analysis.

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 superpozition 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

RAE472 Digital Switching Systems *(graduate)*
3.00 CP (4.50 ECTS)
This course is partly based on CCNP SWITCH 642-813 Official Certification Guide.
Introduction to OSI system Layer 2 and multilayer switch operation. Basic VLAN concepts. End-to-end VLAN. VLAN channel. Ethernet application in campus network. Inter VLAN communication through Layer 3 routing. Switch port aggregation with EtherChannel. Spanning tree protocol. Multilayer switching with CEF. Voice VLAN. Catalyst and ASR switches. Enterprise network, Ethernet carrier environment. Switching in optical networks.

RDE418 Telecommunications Theory (special course) *(graduate)*
4.00 CP (6.00 ECTS)
Electric communication theory (special course) for M.Sc.students of RTU is intended to deepen their knowledge of signal sampling and approximation, of linear system theory basing on entire analytic function theory, as well as of other communication technology theoretical problems. Theory of entire analytic functions is a valuable tool in communication theory and practice because entire analytic functions in the complex plane correspond to the functions with limited spectra on the real axis.The latter are just functions which describe signals transmitted over the bandlimited communication channels. In this way it turns out that the well known sampling (Kotelnikov) theorem is merely the special case of Lagrange's interpolation formula of entire analytic functions enabling also other sampling possibilities including nonuniform sampling. Similiarly, other new possibilities appear in signal approximation and in approximation error evaluation, as well as in signal restoration if only a partial information about the signal is known.Signal multiplexing in CDMA systems and the main branches of quantum information including quantum communications (mainly quantum cryptography) and quantum computers.The following main topics are covered in this special course. Entire analytic functions and their application insignal sampling, approximation and restoration. Properties of Fourier transform. Signal mutiplexing in multichannel systems, CDMA systems. The negentropy principle of information and its meaning for telecommunications. The influence of quantum effects on signal transmission. Quantum communications. Quantum cryptography. Quantum computers. Stochastic resonance.

RDE417 Physics of Optical Information Processing *(graduate)*
4.00 CP (6.00 ECTS)
The course is designed to introduce students to the fundamentals of optoelectronic and optical communications. Topics cover waveguide optics, nanophotonics, metamaterials, holography, optical information processing, laser technology and nonlinear optics, atmospheric laser communications, FOTS information multiplexing and computer simulation.

RAE473 Computer Technologies in Telecommunications *(graduate)*
3.00 CP (4.5 ECTS)
The objective of the course is to enable students to construct software by means of systematic object-oriented analysis and design. The course covers the methods for object-oriented analysis and modelling of application domains and software systems. The analysis includes description of objects and their structuring and functional specifications. The design will include the system modelling with layering and partitioning.

RDE416 Microwave Telecommunications Systems *(graduate)*
4.00 CP (6.0 ECTS)
Topics include microwave propagation, radio communication, attenuation factor, radio link components: antennae, feeder, receiver and transmitter; analogue and digital radio systems, noise immunity, communication stability and grade of service, satellite and mobile systems, short range radio systems for telephone communication.

RDE432 Transmission Systems (special course) *(graduate)*
4.00 CP (6.00 ECTS)
The course deals with transmission systems (TS) at an advanced level. It includes the theoretical analysis of TS, as well as their practical implementation. In the laboratory students are trained in the practical skills in the area of TS. The following topics are discussed: noise and its influence on transmission quality, regeneration of digital signals, baseband line codes, passband line codes, clock extraction and timing, xDSL technologies.

RDE410 Design and Maintenance of Telecommunications Networks *(graduate)*
4.00 CP (6.0 ECTS)
The course deals with projecting of transmission systems. Students identify and define tasks, structure, and content of a project. Topics include principles of electricity supply and powering, maintenance tasks and management, parameters and methods, condition, control means and parameters of communication systems, remote control systems.

RAE553 Signalling Systems and Protocols *(graduate)*
3.00 CP (4.50 ECTS)
The rapid development of telecommunications branches required specialists, who would be able to analyse current situation, forecast development directions, make long-term responsible solutions about favourable signalling/protocol system selection.
The course provides students with the necessary skills for working in the sphere of signalling and communications protocols. Aspects of compatibility, scalability and security are emphasized. Message formats, time and state diagrams of protocols are analysed. Work with protocol analysers in emulation environment provides students with necessary skills for solving problems and preparing for changes in configuration.
Within the framework of the course, students are acquainted with fundamental telecommunications signallings and protocols, analyse its historical development with some essential drawbacks, expand their personal vision for future task solutions in future.

RDE419 Fibre Optic Transmission Systems *(graduate)*
5.00 CP (7.50 ECTS)
Topics covered include FOTS element classification, optical fibre, cables, manufacturing, parameter system, loss mechanism, optical connections, optical waveguide electrodynamics, irradiating and receiving modules, multiplexers, demultiplexers, parameter measurements, optical sensors. International standards related to optical communication systems are discussed. Students are prepared both for practical work with optical elements and further studies at doctoral study programmes.

RAE411 Telecommunications Software *(graduate)*
4.00 CP (6.00 ECTS)
Since in the field of the telecommunications today more and more software is built on the Java platform-independent language base, the telecom professionals need to know the Java language basics - that is the nature of technology, its application areas, language syntax, the key programmatic solutions, and the main technical solutions to hardware. The course covers the diverse range of networking tasks, which include a server-client applications, and traffic reading/generation operations with Java technology, as well as J2ME technology solutions, which allow you to create interactive applications for mobile devices.
The given course provides students with the skills necessary to build Java SE applications and applets as well as Java ME MIDlets.

RAE475 Telecomunications and Computer Networks *(graduate)*
5.00 CP (7.5 ECTS)
Telecommunications networks and systems as a telecommunication business infrastructure are studied. Skills of using the network control and management technologies and tools, network planning skills, network simulation skills and tools are objectives of this course.

RAE555 Teletraffic Theory *(graduate)*
3.00 CP (4.50 ECTS)
The course covers the experimental systems in relation to telecommunications network systems. Within the framework of the course students will discuss the network management and control methods. Students will be enabled to promote their understanding of the performance of real systems. Important part of the course is evaluation methods as well as current trends and problems in the context of Internet, mobile and broadband communications.