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!

Autumn 2017

BACHELOR COURSES

RTR220 Basics of Signal Theory
4.00 CP (6.0 ECTS)
Classification of signals, their characteristics, examples of use in communication systems. Continuous-time periodic and non-periodic signals, Fourier transforms, their properties. Discrete-time signals, Discrete Fourier Transforms, digital filtering, FIR and IIR filters. Modulation, AM, FM, PM signals, digital modulation, transformation of modulated signals by narrowband linear systems. Random signals, their main parameters, principles of measurement, noise in electronic systems.

RTR108Computer 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.

RAE362Digital Devices and Systems
3.00 CP (4.50 ECTS)
Pulse signals and their impact on linear electrical circuits. Pulse signals transformer. Digital switches. Logic families, their parameters and electrical structures. Limiters. Pulse generators. Analogue and digital comparators. Digital to Analogue and Analogue to Digital Converters. Timers. Computer memories. Computer internal and external interfaces.

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.

RAE359 Distributed Systems in Telecommunications
3.00 CP (4.50 ECTS)
The course deals with distributive systems in telecommunications. The goal of the course is to give an introduction to the distributive system problems, modelling of parallel processes and understanding of Open System Interconnection reference model (OSI - RM), functionality and architecture of telecommunications networks.

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.

RDE304 Electrical Measurements in Telecommunications
3.00 CP (4.50 ECTS)
The course provides knowledge about electrical signal measurement methods and principles in the field of electronic communication. The course covers the following measurements: measurement of signal voltage and signal levels; frequency and time interval measurement, measurement and analysis of signal frequency spectrum, attenuation measurement, as well as service quality measurement. Students will obtain knowledge of measuring tools and measuring systems, as well as they learn about measurement and valuation methods of the quality of electronic communication services.

REA103 Fundamentals of Materials Science
2.00 CP (3.00 ECTS)
The role of materials in provision of existence of the human being. Simple materials and composite materials. Structural levels of materials. Interconnection between structure and properties of materials. Practically usable forms of materials. Methods of obtaining of these forms. Technological characteristics of materials. Life cycle of materials. Principles of material selection and new material design strategy.

RAE348 Telecommunications and Computer Networks
3.00 CP (4.50 ECTS)
The objective of the course is to make students understand the development of the Internet together with essential telecommunications network. It will begin with a historical perspective through analysis of the development on the Internet (TCP/IP), email (SMTP) and voice over IP. Difference between switching and routing processes on the telecommunications network and Internet. Open system interconnection reference model and TCP/IP. Types of network: WAN, MAN and LAN, and their characteristic technologies, and routing protocols. Structure of routing tables. Advantages of virtual private networks. MPLS protocol and QoS. Ethernet as carrier, tunnelling. Ethernet over dark fibre. Structure of next generation network. Session initiation protocol. Cluster interconnection on GRID and CLOUD networks. The influence of standards and regulations on development will be included.

RDE201 Telecommunications Systems
4.00 CP (6.0 ECTS)
Telecommunications development history in the world and Latvia. Trends. Report and tone. Steering, transmission and switching systems. Open die and closed systems. Fiber optic systems. Digital and analog systems and networks. Data transmission networks. Communications equipment, classification, application. Individual communications equipment. Telephone, fax, modem connection, use.

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.

MASTER COURSES

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.

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.

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.

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.

DMS436 Mathematical Statistics *(graduate)*
3.00 CP (4.5 ECTS)
Empirical distribution:it's characteristics: data summary and display, sample, frequency tables, mean value, quartiles, variance, standard deviation. Graphical interpretation: histograms, box plots, stem-and-leaf diagrams, time sequence plots. MS Excel usage for descriptive statistics and graphical interpretation. Discrete and continuous random variables, probability distribution, probability mass functions, cumulative distribution functions, mean and variance. Probability distributions: discrete uniform distribution, binomial distribution, geometric distribution, negative binomial distribution, Poisson distribution, normal distribution. Two random variables: joint probability distribution, marginal probability distributions, conditional probability distribution, covariance, correlatio. Generating of random numbers with given distribution function MS Excel generators for uniform distribution and normal distribution. One-sided and two-sided confidence intervals on mean and variance of a normal population. One- sided and two-sided hypotheses testing on mean and variance of a normal population, type 1 error, type 2 error. Linear regression and plotting regression line.

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.

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.

RAE411Telecommunications 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.

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.

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.

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.