RTU Course "Telecommunications and Computer Networks"

13104 Telekomunikāciju tīklu katedra

General data

Code	RAE348
Course title	Telecommunications and Computer Networks
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Academic
Field of study	Electronics and Telecommunications
Responsible instructor	Oļģerts Belmanis
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	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.
Goals and objectives of the course in terms of competences and skills	The goal of the course is to develop students' theoretical knowledge and skills. These are the main outcomes of the course: - Telecommunications networks architecture, development, forecast and operations. Network maintenance and operation control. - Packet transmission (switching) network, architecture, development, forecast and operations. Network maintenance and operation control. - Advantages and disadvantages of packet networks in comparison with circuit switching networks. - Seven-layer open system interconnection reference model. Necessity and different applications of the model. - Routing processes over the Internet. Types of protocols and their operation.
Structure and tasks of independent studies	Students should independently prepare for the test. Students should be able to evaluate their own answers and prepare presentations on the most difficult questions. Students should prepare for the laboratory work and submit report on the gained results.
Recommended literature	1. G.Lauks, A.Kavacis. Daudz-protokolu iezīmju komutēšana. MPLS. Rīga, RTU, 2008. 2. B.S.Goldstein, A.A.Zarubin, V.V.Samorezov. SIP Protocol. Hand-book. BHV, St.Petersburg, 2005. 3. Silvia Hagen. IPv6 Essentials. O'Reilly, 2006. 4.Abdul Kasim. Delivering Carrier Ethernet. McGraw-Hill, 2008. 5.Laura A.Chappel, Ed Tittel. Guide to TCP/IP, third edition. Thomson, 2007. 6.James Macfarlane. Network Routing Basics. Wiley, 2006. 7.Wendel Odom, Rick McDonald. Routers and Routing Basics. Cisco Press, 2007. 8.Martin Maier. Optical Switching Networks. Cambridge University Press, 2008. 9.V.G.Olifer, N.A.Olifer. Kompjuternie seķi (krievu valodā). 3-šais izdevums. Piter, 2006. 10.O.Belmanis. Pakešu komutācija. Mācību līdzelis. RTU TI, 2006. 11.B.S.Goldštein, N.A.Sokolov, G.G.Janovskij. Seti svjazi. BHV, St.Petersburg, 2010. 12.Visi jaunākie internetā piejamie materiāli par šo priekšmetu.
Course prerequisites	Basic knowledge about computer facilities and teletraffic.

Course outline

Theme	Hours
Telecommunications and computer networks. What is common, what is different. Survey on development of technologies.	2
Addressing in telecommunications network. Common channel signalling. SDH. Intellectual network services.	4
Survey on the development of Internet. packet transmission principles. WAN, LAN and regional networks. IPv4 and IPv6	4
Router architecture and routing principles. Understanding routing algorithms and protocols. Laboratory work.	8
TCP/IP protocol suite. Packet transmission and control of looses. ICMP protocol. TCP performance.	4
Autonomous system in IP network. Understanding of RIP, OSPF, IGRP and BGP protocols. Laboratory work.	8
Ethernet as a basic LAN technology. Addressing. Gigabit Ethernet. Ethernet carrier. Optical channels.	2
Multiprotocol label switching technology. Network performance and QoS. Virtual private network. MPLS laboratory work.	8
Voice signal transmission over the Internet. Session initiation protocol.Softswitch.Next generation network architecture	4
High performance computing network architecture. Cluster interoperation on GRID and CLOUD networks	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
Students are able to select network equipment - router or switch - depending on network.	Test
Students are able to choose suitable routing protocols.	Test and laboratory work
Students are able to check accessibility of packet destination point or to find a network unit which causes denial.	Test and laboratory work
Students are able to configure a router in the laboratory.	Laboratory work
Students are able to evaluate network architecture development processes, advantages and disadvantages and mutual impact of telecommunications and computer network development.	Test and exam.
Students are able to analyze distinction between various kinds of information transmission, for example, voice signals and data files.	Test and exam.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	4.5	2.0	1.0	0.0		*	