



RTU Course "Digital Switching Systems"

13104 Telekomunikāciju tīklu katedra

General data

Code	RAE472
Course title	Digital Switching Systems
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Post-graduate Studies
Course type	Professional
Field of study	Electronics and Telecommunications
Responsible instructor	Oļģerts Belmanis
Academic staff	Andris Virtmanis
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	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.
Goals and objectives of the course in terms of competences and skills	At the end of course students should be able to: - describe Layer 2/3 switching operation; - explain VLAN concepts and advantages in enterprise network, voice traffic forwarding over VLAN; - explain advantages of Campus network with Ethernet carrier application, ; - understand Spanning tree topology; - explain Cisco Express Forwarding, packet handling on switching fabrics. The course is partly based on CCNP SWITCH Official Certification Guide therefore successful students are able to continue detailed learning for Cisco certification.
Structure and tasks of independent studies	Carefully study course materials. Preparation to tests, seminars and exams. Choose and specify master thesis theme based on this course.
Recommended literature	<ol style="list-style-type: none"> David Hucabi. CCNP SWITCH 642-813. Official Certification Guide. Pearson Education, 2010. Todd Lammler. CCNA: Study Guide. 6th ed. Wiley Publishing, 2007. Wendell Odom, Russ Healy, Naren Mehta. CCIE Routing and Switching. Cisco Systems, 2008. Paul Simoneau. The OSI Model: Understanding the Seven Layers of Computer Networks. Global Knowledge, 2006. Abdul Kasim. Delivering Carrier Ethernet. McGraw-Hill, 2008. H. Johnatan Chao, Bin Liu. High Performance Switches and Routers. Wiley & Sons, 2007. Oļģerts Belmanis. Ciparu kanālu komutācija. RTU TI, 2005. Oļģerts Belmanis. Pakešu komutācija. RTU TI, 2006. A. Kavacis, G. Lauks. Daudz-protokolu iezīmju komutēšana, MPLS. RTU TI, 2008. Gilbert Held. Carrier Ethernet. CRC Press, 2008. Greg Bernstein, Bala Rajagopalan, Debanjan Saha. Optical Network Control. Pearson Education, Inc, 2004. ASR 9000: Carrier Ethernet Network Architecture Brief. Cisco Systems, 2008. Paul Simonaeu. The OSI Model: Understanding the Seven Layers of Computer Networks. Global Knowledge, 2006. В.Г.Олифер, Н.А. Олифер. Компьютерные сети. Принципы, технологии, протоколы. Изд. 4-ое. Питер, 2010. Visi internetā pieejamie materiāli par šo kursu.
Course prerequisites	Understanding basics of digital switching, Ethernet technology, computer architecture, digital devices operation and basics of teletraffic theory

Course outline

Theme	Hours
Introduction. Switching in packet networks. Layer 2 and multilayer switch operation. Basic Ethernet concepts, how to use	4
VLAN concepts, how to transport multiple VLANs over single links, how to configure VLAN trunks. VLAN Trunking Protocol c	6
Switch port aggregation with Ethernet channel EtherChannel negotiation protocols, EtherChannel Configuration.	4
Traditional Spanning Tree Protocol – IEEE 802.1D. Overview of other STP types. Spanning Tree Configuration. STP topology	4
STP topology protecting using Root Guard, BPDU Guard and Loop Guard. Advanced Spanning Tree Protocol. Rapid Spanning Tree	4
Multilayer Switching. Inter VLAN routing, multilayer switching with Cisco Express Forwarding (CEF).	6
Enterprise Campus Network Design. Ethernet carrier. Different campus network models, hierarchical network design.	6
IP Telephony. How a Catalyst switch can provide power to operate Cisco IP phone.	6
Routers architecture overview. Switching fabrics in routers. Packet handling and preparation to forwarding.	4
Final lecture. Seminar on the most complex items.	2
Optical network switching.	2

Learning outcomes and assessment

Learning outcomes	Assessment methods
Are able to explain Layer2/3 switching process. Understand Ethernet switching advantages. Virtual area network. Concepts and facility. Switch based VLAN. End-to-end Ethernet over VLAN trunk.	-Test, presentation at the seminar.
Are able to explain Spanning tree architecture, topology and configuration. Loop avoidance. STP topology protecting.	-Test, presentation at the seminar.
Understand and are able to explain multilayer switching with Cisco Express Forwarding. Inter VLAN routing. Cisco Catalyst and ASR switches architecture. Voice traffic switching.	-Test, presentation at the seminar.
Are able to explain Enterprise Campus network advantages. Campus network architecture, Ethernet carrier, Ethernet frame forwarding over Campus network.	-Test, presentation at the seminar.
Are able to explain different performance routers and switching fabric architecture. Packet handling and forwarding.	-Test, presentation at the seminar.
Final exam to summarize tests and presentations.	Exam

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	4.5	4.0	0.0	0.0		*	