RĪGAS TEHNISKĀ
UNIVERSITĀTE

RTU Course "Digital Switching Systems"
13104 null

General data

Code	RAE472
Course title	Digital Switching Systems
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Jurģis Poriņš
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN
Annotation	The study course is based in part on the official CCNP SWITCH 642-813 manual. During the study course, students are introduced to the operation of OSI second layer and multilayer switch, basic VLAN concept, VLAN from end to end, VLAN channel. Ethernet applications in CAMPUS networks. Inter VLAN communication through Layer 3 routing, switch port aggregation with EtherChannel, Spanning tree protocol, multilayer switching with CEF are explained. Enterprise network, Ethernet carrier environment, switching in optical networks, network security is shown and explained.
Goals and objectives of the course in terms of competences and skills	The aim of the study course is to provide knowledge about VLAN concept and the basic principles of CNNP Switch. Tasks of the study course: - to describe Layer 2/3 switching operation; - to explain VLAN concepts and advantages in the enterprise network, voice traffic forwarding over VLAN; - to promote understanding advantages of Campus network with Ethernet carrier application; - to provide knowledge about Spanning tree topology; - to provide knowledge about Cisco Express Forwarding, packet handling on switching fabrics.
Structure and tasks of independent studies	Acquire study course materials. Preparation for tests, seminars, and exams. Choose and specify a master thesis theme based on the study course.
Recommended literature	Obligātā/Obligatory: 1. David Hucabi. CCNP SWITCH 642-813. Oficial Certification Guide. Pearson Education, 2010. 2. Todd Lammle, CCNA Certification Study Guide, Volume 2: Exam 200-301, January 2020. 3. В.Г.Олифер, Н.А. Олифер. Компьютерные сети. Принципы, технологии, протоколы. Изд. 4-ое. Питер, 2010. 4. Oļģerts Belmanis. Ciparu kanālu komutācija. RTU TI, 2005. 5. Oļģerts Belmanis. Pakešu komutācija. RTU TI, 2006. 5. A.Kavacis, G.Lauks. Daudz-protokolu iezīmju komutēšana, MPLS. RTU TI, 2008 6. Wendell Odom, Rus Healy, Naren Mehta. CCIE Routing and Switching. Cisco Systems, 2008. Papildu/Additional: 1. Todd Lammle. CCNA: Study Guide. 6th ed. Wiley Publishing, 2007. 2. Paul Simoneau. The OSI Model: Understanding the Seven Layers of Computer Networks. Global Knowledge, 2006. 3. Abdul Kasim. Delivering Carrier Ethernet. McGraw-Hill, 2008. 4. H.Johnatan Chao, Bin Liu. High Performance Switches and Routers. Wiley & Sons, 2007. 5. Gilbert Held. Carrier Ethernet. CRC Press, 2008. 6. Greg Bernstein, Bala Rajagopalan, Debanjan Saha. Optical Network Control. Pearson Education, Inc, 2004. 7. ASR 9000: Carrier Ethernet Network Architecture Brief. Cisco Systems, 2008. 8. Paul Simonaeu. The OSI Model: Understanding the Seven Layers of Computer Networks. Global Knowledge, 2006.
Course prerequisites	Understanding basics of digital switching, Ethernet technology, computer architecture, digital devices operation and basics of teletraffic theory

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction. Switching in packet networks. Layer 2 and multilayer switch operation. Basic Ethernet concepts, how to use.	4	6	0	0
VLAN concepts, how to transport multiple VLANs over single links, how to configure VLAN trunks. VLAN Trunking Protocol.	6	8	0	0
Switch port aggregation with Ethernet channel EtherChannel negotiation protocols, EtherChannel Configuration.	4	6	0	0
Traditional Spanning Tree Protocol – IEEE 802.1D. Overview of other STP types. Spanning Tree Configuration. STP topology.	4	6	0	0
STP topology protecting using Root Guard, BPDU Guard and Loop Guard. Advanced Spanning Tree Protocol. Rapid Spanning Tree.	4	6	0	0
Enterprise Campus Network Design. Ethernet carrier. Different campus network models, hierarchical network design.	6	8	0	0

Network protection from unauthorized access and malicious activities.	6	8	0	0
Routers architecture overview. Switching fabrics in routers. Packet handling and preparation to forwarding.	6	8	0	0
Final lecture. Seminar on the most complex items.	4	6	0	0
Optical network switching.	2	4	0	0
Introduction into SDN.	2	6	0	0
Total:	48	72	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Can explain Layer 2/3 switching process. Understands Ethernet switching advantages. Knows the concept and capabilities of VLANs, as well as end-to-end switchable VLANs through a VLAN channel.	Test, exam.
Is able to explain Spanning tree architecture, topology, and configuration.Orients in STP topology protection. Knows how to avoid loops.	Test, exam.
Orients and is able to explain multilayer switching with Cisco CEF. Knows VLAN internal routing, Cisco Catalyst and ASR switch architecture, voice traffic switching.	Test, exam.
Is able to explain the Enterprise Campus network advantages. Knows network architecture, Ethernet media, Ethernet frame switching and transmission.	Test, exam.
Can explain the architecture of switches used in routers of different performance, preparation of packets for switching and forwarding, and how switching takes place in optical networks.	Test, exam.

Evaluation criteria of study results

Criterion	%
Tests	50
Exam	50
Total:	100

Study subject structure

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