

RTU Course "Telecommunications Software"

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General data

Code	RAE411
Course title	Telecommunications Software
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Elans Grabs
Academic staff	Tianhua Chen Andris Skrastiņš Jūrgis Poriņš Mārtiņš Mihaeljans
Volume of the course: parts and credits points	1 part, 4.0 Credit Points, 6.0 ECTS credits
Language of instruction	LV, EN
Annotation	Modern telecommunications are unimaginable without networking with different protocols and layers, and, accordingly, specific hardware and software resources. The study course is focused on the software part of computer networks and provides knowledge on different programmes and tools to be used for different purposes. These purposes include, but are not limited to, network monitoring, network security, network topology design, and machine learning applications. All these topics are covered by the study course. By the end of the study course, students are expected to have solid skills for further working with networks and traffic software to continue their research or career in this direction.
Goals and objectives of the course in terms of competences and skills	The goal of the study course is to prepare specialists for work with computer networks analysis and simulation software, as well as monitoring tools and programmes. The main objectives of the study course are: 1. To provide basic knowledge on network protocols and tools used for reading this information for network traffic. 2. To develop skills of working with Python programs and libraries/frameworks for traffic collecting, evaluation, and monitoring. 3. To provide knowledge on network security issues and software, that can be used for analysing network security.
Structure and tasks of independent studies	The practical works require not only working with specified software but also processing results and analysing/improving programme code. During the class lessons, only basics will be covered for each tool, so students will have to set up these tools on their own computers, as well in order to fully complete all practical work tasks.
Recommended literature	Obligātā/Obligatory: 1. Studiju kursa materiāli portālā ORTUS / Study course materials in ORTUS portal. 2. Michael G. Solomon, David Kim. Fundamentals of Communications and Networking, 3rd Edition, 2021, Jones & Bartlett Learning. 3. Chwan-Hwa Wu, J. David Irwin. Introduction to Computer Networks and Cybersecurity. 2016. CRC Press. 4. TCPDump documentation: https://www.tcpdump.org/manpages/tcpdump.1.html . 5. Cisco Packet Tracer courses: https://www.netacad.com/courses/packet-tracer . 6. Wireshark documentation and videos: https://www.wireshark.org/docs/ . 7. Python documentation: https://docs.python.org/3/ . 8. Tshark documentation: https://documentation.help/Wireshark-2.1/AppToolstshark.html . 9. Nfstream framework documentation: https://www.nfstream.org/docs/ . Papildu/Additional: 1. Jason Edelman, Scott S. Lowe, and Matt Oswalt. Network Programmability and Automation: Skills for the Next-Generation Network Engineer (1st. ed.), 2018, O'Reilly Media, Inc. 2. Eric Chou, Michael Kennedy, Mandy Whaley. Mastering Python Networking: Your One-stop Solution to Using Python for Network Automation, Programmability, and DevOps, 3rd Edition, 2020, Packt Publishing, Birmingham. 3. Boutaba, R., Salahuddin, M.A., Limam, N. et al. A comprehensive survey on machine learning for networking: evolution, applications and research opportunities. J Internet Serv Appl 9, 16 (2018). https://doi.org/10.1186/s13174-018-0087-2 .
Course prerequisites	Basics of computer networks.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Telecommunication protocols. Standardization.	8	12	0	0
Virtual machines and virtual private networks.	8	12	0	0
Network vulnerability and attacks.	8	12	0	0
Wi-Fi networks standards and topologies.	12	20	0	0
WireShark for network traffic analysis.	12	20	0	0

Machine Learning models for network traffic.	16	20	0	0
Total:	64	96	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to use simple network tools in Linux virtual environment for analysing network connections.	Practical work report. Exam.
Is able to use Libpcap & TCPDump tools for more advanced analysis of network operation.	Practical work report. Exam.
Is able to use Wireshark to collect, analyse and dissect live network traffic.	Practical work report. Exam.
Is able to use Cisco Packet Tracer tool to develop network models and simulations for network performance evaluation.	Practical work report. Exam.
Understands the principles of Python programming language and corresponding libraries/frameworks for network traffic analysis.	Practical work report. Exam.
Knows machine learning concepts and their application for network traffic classification using Python programming language.	Practical work report. Exam.

Evaluation criteria of study results

Criterion	%
Practical works report	70
Exam	30
Total:	100

Study subject structure

Part	CP	Hours per Week			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	4.0	2.0	1.0	1.0		*	