

Courses in English

Course Description

Department	07 Computer Science and Mathematics
Course title	Computer Networks in Practice
Course number	
Hours per week (SWS)	4
Number of ECTS credits	5
Course objective	<p>TECHNICAL AND METHODOLOGICAL COMPETENCE: To provide students with a broad and at the same time deep insight into the practical construction and operation of computer networks in practice They will acquire the practical skills to: build local computer networks, configure them, customize them and connect them to the Internet, adjust common network components (routers, switches, servers, PCs), analyze the network protocols between network components, identify errors in the network and resolve them.</p> <p>INTERDISCIPLINARY COMPETENCIES: Teamwork: students work out their project task in groups of 2, learn to document the results of the project work in a structured way in order to present it live at the end of the semester.</p>
Prerequisites	Programming knowledge in an object-oriented programming language, basics of computer networks (corresponding to the course data communication)
Recommended reading	1.Harald Zisler, „Computer Netzwerke Grundlagen, Funktionsweisen, Anwendungen“, Rheinwerk Computing Verlag, 2022. 2.James F. Kurose and Keith W. Ross, "Computer Networking", 7th Edition Pearson, Addison Wesley, New York, 2018. 3.Peter Mandl, Andreas Bakomenko, Johannes Weiß, „Grundkurs Datenkommunikation, TCP/IP–basierte Kommunikation: Grundlagen, Konzepte und Standards“, 2. Auflage, Vieweg + Teubner Verlag, Heidelberg, 2010.
Teaching methods	slides, video conferences, whiteboard, guest lectures, LMS
Assessment methods	Study work, oral presentation
Language of instruction	English
Name of lecturer	Prof. Alexandru Soceanu
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Link	
Course content	<p>Computer Network Fundamentals Review: Reference models, layers services, addressing, subnetting, NAT/PAT, routing, routing tables, VLAN, network protocols: FTP, TFTP, HTTP, HTTPs, DNS, DHCP, TCP, IPv4, IPv6, RIPv2, OSPF, Ethernet Function and use of hypervisors for the purpose of virtualization of networks using the example of Oracle Box and virtual machines Setup principle and operation of components of a virtual LAN:VM configuration, VM interfaces, network segmentation principle, DMZ principle, connection of LAN with public Internet, NAT principle Introduction to network security principles, VPN concept Exercises in virtual lab on the following topics: 1) building a virtual computer network lab with the help of a virtual network environment using Oracle Box Hypervisor, 2) installation, configuration of Oracle Box Hypervisor, download VMs with associated images for network components: Router, Switches, PC Clients, Servers (FTP,WEB) 3) Configuration of virtual LAN: VLAN, Subnets, Subnet masks, IP mapping, 4) Configuration of connection of virtual LAN with public Internet via NAT 5) Segmentation into network zones: Server Farm Segment, Departmental Components Segment, DMZ Segment, Network Monitoring Segment, setting access rules between segments, 6) Analysis in experimental LAN of: a) Application protocols: FTP, TFTP, HTTP, HTTPs, DNS, SMTP, POP3, b) transport protocols: TCP, UDP, and c) network protocols: IPv4, IPV6, ICMP using Wireshark analyzer 7) Routing setting within virtual LAN and analysis in operation of routing protocols: Static, RIPv2, OSPF 8) Setting and using QoS (Quality of Service) and CoS (Class of Service) in case of multimedia applications (e.g.: Voice over IP) 9) Setting and analyzing NAT and firewall properties at router level 10) Setting and using OpenVPN principle to secure data transmission via internet</p>
Remarks	