Course Title	Computer Networks I				
Course Code	ACOE313				
Course Type	For BSc Computer Engineering, BSc Computer Science: Compulsory For BSc Electrical Engineering: Technical Elective				
Level	BSc (Level 1)				
Year / Semester	2nd (Spring)				
Teacher's Name	Chrysostomos Chrysostomou				
ECTS	5	Lectures / week	3	Laboratories/week	1
Course Purpose	This course aims to introduce students to computer networks with emphasis on the architectures, models, protocols, and networking elements and functions related to the Internet layered design: Physical, Data Link, Network, Transport and Application layer principles.				
Learning Outcomes	By the end of the course, the students are expected to: 1. outline network representations and how they are used in network topologies; 2. compare the characteristics of common types of networks; 3. explain how network protocols enable devices to access local and remote network resources and illustrate how data encapsulation allows data to be transported across the network; 4. describe how physical layer protocols, services, and network media support communications across data networks; 5. define the purpose and function of the data link layer in preparing communication for transmission on specific media and compare the characteristics of media access control methods on WAN and LAN topologies; 6. outline how Ethernet works in a switched network, illustrate how a switch builds its MAC address table and forwards frames, recognize and distinguish switch forwarding methods and port settings available on Layer 2 switch ports; 7. recognize how network devices use routing tables to direct packets to a destination network, compare and contrast static and dynamic routing and distinguish the IPv6 simplicity to IPv4s complexity; 8. distinguish the roles of the MAC address and the IP address and demonstrate how ARP and IPv6 neighbor discovery enable communication on a network; 9. define the structure of an IPv4 address identifying the network portion, the host portion, and the subnet mask;				

	10. explain how subnetting segments a network to enable better communication, and calculate and design an IPv4 subnetting scheme to efficiently segment a network; 11. explain how IPv6 addresses are represented, compare types of IPv6 network addresses and implement an IPv6 addressing scheme; 12. distinguish the operations of transport layer protocols in supporting end-to-end communication; 13. explain how TCP protocol data units are transmitted and acknowledged to guarantee delivery and outline how TCP session establishment and termination processes facilitate reliable communication; 14. outline the operation of application layer protocols in providing support to end-user applications; 15. identify security threats, vulnerabilities, attacks and general mitigation techniques; 16. illustrate how to access a Cisco IOS device for configuration purposes and how to navigate Cisco IOS to configure network devices, describe the command structure of Cisco IOS software, implement configuration settings on a Cisco IOS device using CLI, and verify connectivity between two end devices; 17. perform simulation and modeling activities to explore, acquire, reinforce, and expand practical skills.		
Prerequisites	ACOE161	Co-requisites	None
Course Content	• **Networking Today:** Networks Affect our Lives. Network Components. Network Representations and Topologies. Common Types of Networks. Internet Connections. Reliable Networks. Network Trends. Introduction to Network Security. The IT Professional. • **Protocols and Models:** The Rules and Protocols. Protocol Suites. Standards Organizations. Reference Models. Data Encapsulation. Data Access. • **Physical Layer:** Purpose of the Physical Layer. Physical Layer Characteristics. Copper Cabling. UTP Cabling. Fiber-Optic Cabling. Wireless Media. • **Data Link Layer:** Purpose of the Data Link Layer. Topologies. Data Link Frame. • **Ethernet Switching:** Ethernet Frame. Ethernet MAC Address. The MAC Address Table. Switch Speeds and Forwarding Methods. • **Network Layer:** Network Layer Characteristics. IPv4 Packet. IPv6 Packet. How a Host Routes. Router Routing Tables. • **Address Resolution:** MAC and IP. ARP. Neighbour Discovery. • **IPv4 Addressing:** IPv4 Address Structure. IPv4 Unicast, Broadcast, and Multicast. Types of IPv4 Addresses. Network Segmentation. Subnet an IPv4 Network. • **IPv6 Addressing:** IPv4 Issues and the need for IPv6 addressing. IPv6 Address Representation. IPv6 Address Types. Global Unicast and Link-		

	local IPv6 Network Addresses Static Configuration. Dynamic Addressing for IPv6 Global Unicast Addresses. • **ICMP:** ICMP Messages. Ping and Traceroute Testing. • **Transport Layer:** Transportation of Data, TCP Overview, UDP Overview, Port Numbers, TCP Communication Process, Reliability and Flow Control, UDP Communication. • **Application Layer:** Application, Presentation, and Session. Peer-to-Peer. Web and Email Protocols. IP Addressing Services (DNS, DHCP). File Sharing Services. • **Network Security Fundamentals:** Security Threats and Vulnerabilities. Network Attacks. Network Attack Mitigation. Device Security. • **Basic Switch and End Device Configuration:** The role of the Internetwork Operating System (IOS). IOS Access. IOS Navigation. The Command Structure. Basic Device Configuration. Save Configurations. Ports and Addresses. Configure IP Addressing. Verify Connectivity. • **Basic Router Configuration:** Configure Initial Router Settings. Configure Interfaces. Configure the Default Gateway. • **Laboratory Work:** Simulation and modeling exercises, using networking simulation tool and packet analysis software, to enable students understand how data is transmitted over the network and get familiar with the layered design of network protocols.
Teaching Methodology	Students are taught the course through lectures by means of computer presentations. Lectures are supplemented with laboratory work, which consists of simulation and modeling activities to design and analyse computer networks, aiming to help students develop practical skills by illustrating the main concepts taught at lectures. Lecture/Laboratory notes and presentations are available for students to use in combination with the textbooks and references, through the university's e-learning platform.
Bibliography	Textbook: • James Kurose and Keith Ross, ***Computer Networking: A Top-Down Approach***, Pearson, 8th Edition, 2021 References: • William Stallings, ***Data and Computer Communications***, Pearson, 10th Edition, 2014 • Cisco Certified Network Associate (CCNA v7), ***Introduction to Networks***, Cisco Networking Academy, 2019
Assessment	The assessment of the course includes two written tests, multiple-choice quizzes and a final written exam with practical and theoretical questions. Laboratory work consists of simulation and modeling exercises using networking simulation tool and/or packet analysis software requiring students to design and analyze computer networks. The weights for each assessment component are: • Lab Work: 15%

	• Quizzes: 10% • Tests: 15% • Final Exam: 60%
Language	English