

Computer Networks				ELCE B416H	
Module Name (Kurdish)	تۆرین کۆمپیوتەر				
Module Name (Arabic)	شبكات الحواسيب				
Contact Hours/Week (Theory)	3	Contact Hours/Week (Practical)	2	Self-study Hours/Week	5
Language of Instruction	English	Semester Delivered	7	Credits (ECTS)	6
Course Type	Core	Version Number	1.0	Version Date	03-12-2024
Prerequisite 1	Communication Systems			Code	ELEC B311H
Prerequisite 2				Code	
Co-requisite				Code	
Dept. /College	Electrical and Computer Engineering/Engineering			Code	ELCE/ENG
Owner Dept. /College	Electrical and Computer Engineering/Engineering			Code	ELCE/ENG
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Module Overview					
This module is designed to help students understand the basics of data communications and networking and the protocols used. The course teaches the principles of networking using the TCP/IP reference model. Teaching these principles using protocol layering is beneficial because these principles are repeated and better understood in relation to each layer.					
Learning Outcomes					
Upon successful completion of this module, students will be able to:					
● Explain the foundational principles of computer networks and common network models such as OSI and TCP/IP and describe the functionalities of each layer in the TCP/IP reference model. ● Identify and describe various types of networks (LAN, WAN, MAN, PAN) and their purposes. ● Explain the operation of controlled access MAC protocols (such as reservation, polling and token passing) and random access MAC protocols such as ALOHA, CMA/CD. ● Describe the basics of wireless networking, including Wi-Fi standards (802.11x) and wireless media access methods such as CSMA/CA and PCF. ● Explain spanning tree algorithm and basic switching concepts and show VLANs work. ● Explain the role and operation of core network protocols such as ARP, IP, ICMP, TCP, UDP, DHCP. ● Apply IP addressing schemes, including IPv4 and IPv6, and use subnet addressing techniques to design efficient IP subnets that meet specific network requirements. ● Explain unicast routing algorithms, including distance vector and link state routing algorithms. ● Use network monitoring tools (such as Wireshark) to analyze network traffic and diagnose network performance issues. ● Use Cisco Packet Tracer simulation tool to design and configure different network scenarios, creating fully functional simulated network environments.					
Topics Covered					
● Overview ○ Physical Topologies ○ TCP/IP Protocol Suite ○ OSI Reference Model ● Physical Layer ○ Digital Transmission ○ Analog Transmission ○ Bandwidth Utilization: Multiplexing and Spectrum Spreading ○ Transmission Media ● Data-Link Layer ○ Data Link Layer Services					

- o DLC and MAC Sublayers
- o Address Resolution Protocol (ARP)
- Medium Access Control Sublayer (MAC)
 - o Multiple Access Protocols
 - ALOHA
 - Pure ALOHA
 - Slotted ALOHA
 - Carrier Sense Multiple Access (CSMA)
 - CSMA Persistence Methods
 - Carrier Sense Multiple Access with Collision Detection (CSMA/CD)
 - Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
 - Controlled Access Methods (Reservation, Polling, Token passing)
- Wired LANs: Ethernet
 - o IEEE 802 project
 - o Ethernet Frame Format
 - o Standard Ethernet
 - o Bridges and Collision Domain
 - o Fast Ethernet
 - o Gigabit Ethernet
 - o 10 Gigabit Ethernet
- Wireless LANs
 - o IEEE 802.11
 - o Distributed Coordination Function (DCF)
 - o Point Coordination Function (PCF)
 - o Hidden Station Problem
 - o Connecting Devices and VLANs (Repeaters, Hubs, Bridges, Switches, Learning Switches)
 - o Loop Problem in Learning Switches
 - o Spanning Tree Algorithm
 - o VLANs
- Network Layer: Logical Addressing
 - o Internet Protocol IPv4
 - o IP Classful Addressing
 - o Subnetting and Supernetting
 - o Classless Address
 - o Designing Subnets (Classful and Classless)
 - o Dynamic Host Configuration Protocol (DHCP)
 - o Network Address Translation (NAT)
- Network-Layer Protocols
 - o IP Datagram Format
 - o IP Options
 - o ICMPv4
 - ICMPv4 Error Reporting Messages
 - ICMPv4 Query Messages
 - o Debugging tools (Ping, Traceroute, Tracert)
- Network Layer Routing Protocols
 - o Least Cost Routing and Least Cost Trees
 - o Distance-Vector Routing Algorithm
 - Bellman-Ford Equation
 - Distance Vectors
 - o Link-State Routing
 - Link-State Database (LSDB)
 - Dijkstra's Algorithm
- Transport Layer
 - o Transport Layer Services

- o Transport-Layer Protocols - User Datagram Protocol (UDP) - Transmission Control Protocol (TCP) - o Port Numbers ● IPv6 - o IPv6 notations - o IPv6 Address Types - o Global Unicast Addresses
Mode of Delivery
This module is delivered in person and includes classes and lab sessions that the student should attend. Maximum of 10% absence is permitted.
Assessment Methods and Grading
The grading and assessment of this module is done as below: ● 5% Homework ● 10% Quizzes ● 10% Lab. Reports and quizzes ● 10% Lab. final exam ● 25% One mid semester exam ● 40% Theory final exam
Passing Requirements
To pass this module successfully, the student should: ● complete all course requirements ● do the final lab exam ● do the final theory exam ● get a total score of 50 or greater
Module Reading List and References
● Key references - o Forouzan, A. Behrouz. Data communications & networking. 5th Edition, McGraw-Hill Education, 2012. - o Tanenbaum, Andrew S., and David Wetherall. Computer networks. 5th Edition, Harlow, Essex: Pearson, 2014. - o McMillan, Troy. Cisco networking essentials. 2nd Edition, John Wiley & Sons, 2015. ● Useful references: - o Peterson, Larry L., and Bruce S. Davie. Computer networks: a systems approach. 5th Edition, Elsevier, 2014.