University of Asia Pacific (UAP)
Department of Computer Science & Engineering (CSE)

Course Outline: CSE 311

Program: Computer Science & Engineering
Course Title: Data Communication and Computer Networks
Course Code: CSE 311
Semester: Spring 2025
Level: 3-2 (A, B, C, D)
Credit Hour: 3.0
Name & Designation of Teacher: Dr. Md Towfiqur Rahman, Assistant Professor
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Consultation Hours:

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 Rationale: The objectives of the course are to develop students' understanding of data communication fundamentals and networking principles, models, protocols, and technologies for designing reliable communication systems and networks.

Pre-requisite: CSE 311 (Data Communication)

Course Synopsis: This course covers computer network concepts such as working principals of the OSI layer, networks security, Data transmission techniques such as analog and digital signal transmission, switching, encoding techniques, multiplexing techniques, error detection and correction techniques.

Course Objectives: The objectives of this course are to:

1. Understanding Fundamentals: Students will grasp the fundamental concepts of data communication and computer networks, including the OSI model, TCP/IP protocol suite, and the principles of data transmission.
2. Network Design and Implementation: Students will learn the principles of network design, including topology, network hardware, and addressing schemes. They will be able to design and implement basic computer networks to meet specific requirements.
3. Introduce the student to basic data communication principles and concepts, implement data communication system architecture, preparing the student for entry into advanced courses in data communication.
4. To learn analog and digital signal transmission, switching, encoding techniques, multiplexing techniques, error detection and correction techniques.
    Course Outcomes (CO) and their mapping with Program Outcomes (PO) and Teaching Learning Assessment methods:

CO No.	CO Statements: Upon successful completion of the course, students should be able to:	Correspond ing POs (Appendix-1)	Bloom's taxonomy level (Appendix-2)	Delivery methods and activities	Assessm ent Tools
CO1	**Illustrate** the concept of Computer Networking, Wireless, and Data communication, the idea of different networking layers, topologies, and transmission functionality during message transfer.	a	Understand (Cognitive)	Video Lecture, PPT Presentation	Quiz, Short Question written exam
CO 2	**Analyze** key performance metrics (bandwidth, latency, throughput, SNR) and encoding methods and evaluate error detection, flow control, and IP addressing.	b	Apply (Cognitive)	Lecture, Problem Solving	Quiz, Short Question written exam
CO 3	**Analyze** the performance of data communication system architecture for Digital and Analog Transmission, IP subnetting, the application of different networking and routing protocols.	b	Analysed (Cognitive)	Problem Solving, Group discussion	Quiz, Short Question written exam
CO 4	**Evaluate** the mechanisms for channel Bandwidth utilization using encoding and decoding methods, Multiplexing.	c	Evaluate (Cognitive)	Video Lecture, Problem Solving	Short Question written exam

Weighting COs with Assessment methods:

Assessment Type	% weight	CO1	CO2	CO3	CO4
Final Exam	**50%**				
Mid Term	**20%**				

Class Performance, Class Tests, Assignments	**30%**				
Total	**100%**				

Grading Policy: As per the approved grading policy of UAP (Appendix-3)

Course Content Outline and mapping with COs

Lecture	Topics / Content	Course Outcome	Delivery methods and activities
1	**Overview of the data Communication system & Computer Networks** o What is a computer network? o Types of Networks: LAN, WAN, MAN o Network Components: Hosts, Routers, Switches, Hubs o Applications of computer networks (email, web browsing, file transfer, etc.)	CO1	Live Video Lecture, PPT Presentation
2	**Networking Devices** o Hubs, Switches, Routers, and Bridges o Functions and differences between devices Switch vs Router vs Hub vs Bridge	CO1	Lecture, PPT Presentation
3	**Types of Network Communication** o Synchronous vs Asynchronous communication o Half-duplex vs Full-duplex communication network structure, Delay, loss, throughput in networks **Network Topologies** (Physical and Logical Topologies)	CO1	Lecture, PPT Presentation
4	**Physical Layer**: **switching** (packet switching, circuit switching)	CO1	Lecture, PPT Presentation

5	**OSI and TCP/IP Model (Open Systems Interconnection)** The OSI Model, Comparison of the OSI and TCP/IP reference model. (Physical, Data Link, Network, Transport, Session, Presentation, Application, Functions of each layer)	CO2	Lecture, PPT
6	**IP Addressing** o IPv4 and IPv6 Addressing o Subnetting, Subnet Masks o	CO2	Presentation
7	**Class Test -1**	CO1	
8	CIDR (Classless Inter-Domain Routing) [Problems]	CO2	Presentation
9	**Transmission Media** o Guided Media (Twisted Pair, Coaxial Cable, Fiber Optic) o Unguided Media (Radio Waves, Microwaves, Infrared) Advantages, disadvantages, and usage of each medium	CO2	Lecture, PPT
10	**Digital to Digital conversion- Line coding:** Concept, Line coding, Unipolar, Polar, NRZ, RZ, Bipolar,	CO2	Presentation
11	**Digital to Digital conversion- Line coding**: Manchester and Differential Manchester coding, Multilevel Schemes, Multiline o	CO2	Lecture, PPT
	Class Test -2		
12	**Flow Control and Sliding Window Protocols** o Stop-and-Wait Protocol o Selective Repeat o Sliding window protocols o Go-Back-N ARQ	CO3	Presentation
13	**Flow Control and Sliding Window Protocols** o Sliding window protocols o Go-Back-N ARQ	CO3	Lecture, PPT

	Analog to Digital conversion- Sampling, Pulse Amplitude Modulation, Pulse Code Modulation, and Transmission: Serial, Parallel, Synchronous, And Asynchronous.		
14	**Data Link Layer - Framing and Error Control** o Data framing techniques Error detection and correction techniques (Parity, CRC, Hamming Code)	CO3	Presentation
	Midterm Exam		
15	**Errors Detection Maths**: CRC, LRC, Checksum, Hamming distance	CO3	Lecture, PPT
16	**Analog Transmission:** Amplitude Shift Keying, Frequency Shift Keying. Phase Shift Keying, Quadrature Amplitude Modulation, Modems, Analog signal, Amplitude Modulation, Frequency Modulation, Phase Modulation	CO3	Presentation
17	**Multiplexing:** Concept, Frequency Division Multiplexing, Analog Hierarchy, Wavelength Division Multiplexing (WDM), Time Division Multiplexing (TDM),	CO3	Lecture, PPT
18	**Discussion** on Subnetting FLSM, VLSM, NAT, IPV4 Addressing	CO3	
	Class Test -3		
19	**Application Layer Protocols** o HTTP/HTTPS, FTP, DNS, SMTP, POP3, IMAP o Client-Server vs Peer-to-Peer models	CO4	Live Video Lecture, PPT, Presentation
20	**Routing Protocols** o RIP (Routing Information Protocol) o OSPF (Open Shortest Path First)	CO4	Live Video Lecture, PPT Presentation

21	**Routing Algorithms**
	   o Routing principles
	   o Distance Vector (Bellman-Ford), Link State (OSPF) o BGP (Border Gateway Protocol)
	   o Static vs. Dynamic Routing
		CO4	Live Video Lecture, PPT Presentation, problem solving, group discussion

22		CO4	Live Video Lecture, PPT Presentation,

23	**Cellular Networks** o Cellular Architecture (GSM, CDMA, LTE, 3G/4G/5G/6G) Mobile IP and Mobile Computing	CO4	Live Video Lecture, PPT Presentation,
24	**Class Test -4**		
25	**Review Class and Preparation for Final Exam**		All classes

Required Reference(s): (1) Computer Networking A Top-Down Approach (CNA) - *James F. Kurose*

Recommended Reference(s): (1) Data Communications and Networking,
(DCN) - *Behrouz A. Forouzan*, *McGraw Hill,* 5th
Edition
(2) Cloud Services For Dummies, IBM Limited Edition

Special Instructions:
- · Minimum Required Attendance: 70% class attendance is mandatory for a student in order to appear at the final examination.
- · Late presence: Consecutive two days late presence in the class will be counted as one day absent
- · Assignment submission rules: Have to submit before the midnight of the submission date through email.

Prepared by	**Checked by**	**Approved by**
Course Teachers	Chairman, PSAC committee	Head of the Department

Appendix-2
CO-PO Mapping Matrix

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CO1	√									
CO2	√										
CO3		√									

CO4 √

Appendix-3: Grading Policy

Numeric Grade	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00