PRINCIPLES OF DATA COMMUNICATIONS

Reference Book:

Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw Hill

1. Introduction to Networks

Topology		
Types of Networks		
Switching	Circuit Switching Packet Switching	
Network Models	TCP/IP OSI	

2. Introduction to Physical Layer

Data and Signals	Analog & Digital Data Analog & Digital Signals Periodic & Non-Periodic Signals Discrete & Continuous Signals	
Periodic Analog Signals	Sine Wave	Peak Amplitude Period & Frequency Phase
	Wavelength	
	Composite Signals	
	Bandwidth	
Digital Signals	Bit Rate	
	Bit Length	
	Digital Signal as a composite analog signal	
	Transmission of Digital Signals	Baseband Broadband
Transmission Impairment	Attenuation : Decibel Distortion Noise : SNR, SNR_{db}	
Data Rate Limits	Noiseless Channel	Nyquist bit rate
	Noisy Channel	Shannon Capacity
Performance	Bandwidth Throughput Latency (delay) Bandwidth-Delay Product Jitter	
Fourier Analysis		
Energy & Power Signals		
Mathematical Review		

3. Digital Transmission

Digital to Digital Conversion	Line Coding	Unipolar Scheme -NRZ Polar Schemes -NRZ, RZ, biphase(Manchester, Differential Manchester) Bipolar Schemes -AMI & Pseudoternary
	Block Coding	4B/5B
	Scrambling	Bipolar with 8-zero substitution (B8ZS) HDB3 (High Density Bipolar 3-zero)
Analog to Digital Conversion	Pulse Code Modulation (PCM)	Sampling Sampling Rate (Nyquist Theorem) Quantization
	Delta Modulation (DM)	

4. Analog Transmission

Digital to Analog Conversion	Amplitude Shift Keying (ASK) Frequency Shift Keying (FSK) Phase Shift Keying (PSK)
Analog to Analog Conversion	Amplitude Modulation (AM) Frequency Modulation (FM) Phase Modulation (PM)

5. Multiplexing

Frequency Division Multiplexing (FDM)
Time Division Multiplexing (TDM)
Wavelength Division Multiplexing (WDM)

6. Introduction to Data Link Layer- Addressing

7. Error Correction & Detection

Types of Errors **Detection vs. Correction**	
Block Coding	Hamming Distance Linear Block Code Parity Check Code
Cyclic Code	CRC
Checksum	
Forward Error Correction (FEC)	using Hamming Distance XOR

8. Source Coding

Information Theory : Entropy, Hamming Code
Fixed & variable length encoding
Shannon Fano Coding
Huffman Coding
Runlength Coding
Lempel-Ziv Algorithm

9. Ethernet & Wireless LAN

Ethernet (IEEE 802.3)	Access Method: CSMA/CD Standard Ethernet Fast Ethernet Gigabit Ethernet 10 Gigabit Ethernet
IEEE 802.11	CSMA/CA NAV Hidden and Exposed Terminal Problems