Politeknik Elektronika Negeri Surabaya

Data Communications

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Data Communications
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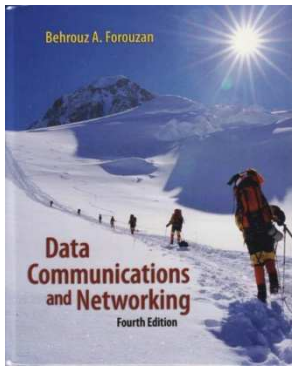
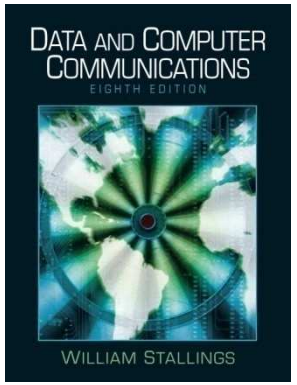
Overview

- This course provides a basic introduction to data communication
- **The topics covered include** :
  - an introduction to data transmission and signals
  - transmission media
  - concepts of bandwidth utilization and system performance
  - transmission impairments
  - and error detection and correction
- **Required Text Books** :
  - Data Communication and Networking, 4th Edition, by Behrouz A. Forouzan, McGraw Hill
  - Data and Computer Communications, 8th Edition, by William Stalling, Pearson prentice Hall





Introduction – 1st week

- **Communication Systems**
  - Components of a data communications system
  - Data flow
- **Data Networks**
  - Sender, receiver, and carrier
  - Hierarchy

Data and Signal-Analog and Digital
2nd-4th weeks

- **Periodic and Aperiodic Analog Signals**
  - Analog and digital data
  - Analog and digital signals
  - Perodic and non-periodic signals
- **Digital signals**
  - Bit rate
  - Bit length
  - Digital signal as a composite analog signal
- **Transmission Impairments**
  - Attenuation
  - Distortion
  - Noise
- **Data rate limits**
  - Noiseless channel, nyquist bit rate
  - Noisy channel, shannon capacity
  - Using both limits
- **Performance of transmission system**
  - Bandwith – capacity of the system
  - Throughput – number of bits that can be pushed through
  - Latency (delay) – delay incurred by a bit from start to finish

Transmission Media– 5th-6th weeks

- **Guided**
  - Twisted-pair cable
  - Coaxial cable
  - Fiber optic cable
- **Unguided Media**
  - Radio waves
  - Microwaves
  - Infrared

Analog Transmission– 7th-8th weeks

- **Digital to Analog Conversion**
  - Aspect of digital-to-analog conversion
  - Amplitude shift keying
  - Frequency shift keying
  - Phase shift keying
  - Quadrature amplitude modulation
- **Analog to Analog Conversion**
  - Amplitude modulation
  - Frequency modulation
  - Phase modulation

Digital Transmission – 9th-10th weeks

- **Digital to Digital Conversion**
  - Line coding
  - Line coding scheme
  - Block coding
  - Scrambling
- **Analog to Digital Conversion**
  - Pulse code modulation (PCM)
  - Delta modulation (DM)
- **Mode Transmisi**
  - Simplex, half-duplex, full-duplex
  - Serial dan parallel transmission
  - Synchronous and asynchronous transmission

Bandwith Utilization – 11th-12th weeks

- **Multiplexing**
  - Frequency-division multiplexing
  - Wavelength-division multiplexing
  - Synchronous time-division multiplexing
  - Statistical time-division multiplexing
- **Spread Spectrum**
  - Frequency hopping spread spectrum (FHSS)
  - Direct sequence spread spectrum (DSSS)

Error Detection and Correction – 13th-16th weeks

- Types of errors, redundancy, detection vs correction
  - Types of errors
  - Redundancy
  - Detection vs correction
  - Forward error correction vs retransmission
  - Coding
  - Modular arithmetic
- Types of Coding – Hamming Codes, Cyclic Redundancy Check, Checksum
  - Linear block codes, minimum distance for linear block codes, some linear block codes
  - Cyclic codes : CRC, hardware implementation, polynomials, cyclic code analysis, advantages of cyclic codes, other cycclic codes
  - Checksum : idea, ones's complement, internet checksum