

**Amended Course as passed by the Subject Committee Meeting held on Feb. 29, 2004.**

**CMM 362.3 Data Communication (3-1-2)**

|           | <b>Theory</b> | <b>Practical</b> | <b>Total</b> |
|-----------|---------------|------------------|--------------|
| Sessional | 30            | 20               | 50           |
| Final     | 50            | -                | 50           |
| Total     | 80            | 20               | 100          |

**Course objectives:**

1. To Appreciate the Concept of Data Communication.
2. To understand the basics of communication signals
3. To understand the requirements to get two computers exchange data.
4. To understand the basics of switching and networking.

**Course Contents:**

1. **Introduction:** (3 hrs)  
Evolution of Data Communication systems, Analog and Digital Data Transmission, Data Communication Terminology, Standards Organizations, Applications.
2. **Data Transmission:** (3 hrs)  
Parallel and Serial Transmission, Line Configuration, Synchronous/ Asynchronous Communication, Bit Rate/ Baud rate, Transmission Channel, RS-231C and RS-449 Interface Standards.
3. **Signals and Systems:** (5 hrs)  
Signals and their classification: Periodic and non-periodic signals; Deterministic and Random signals; Energy and Power signals; Continuous and Discrete time signals. Continuous and Discrete time system, Basic system properties: Linearity, Causality, Stability and Time Invariance.
4. **Analysis of Signals and System's response:** (6 hrs)  
Unit Step function and Impulse function, Impulse response, Fourier series representation: Continuous time Fourier series and Discrete time Fourier series, Fourier Transform: Continuous and Discrete time Fourier transform.
5. **Overview of Date Communication Networking:** (3 hrs)  
Network Types, Topology, OSI layers and Functions, *Local Area Networks*: LAN Architecture, LLC/MAC & Routing IEEE Standards, Ethernet ( CSMA/CD), *Wide Area Networks*: X. 25, Frame Relay, ATM.
6. **Transmission Media:** (4 hrs)  
Electromagnetic Spectrum for Telecommunication, Type of Propagation. Guided Transmission Media: Twisted-Pair Cable, Co-axial Cable, Optical Fiber. Characteristics of Unguided Communication Bands, Antennas, Unguided

transmission Media: Terrestrial Microwave, Satellite Communication, VSAT, and Cellular Telephony.

7. **Impairments, Error handling and Compression Techniques: (4 hrs)**  
Attenuation & Distortion, Delay Distortion, Noise & Types, interference, Crosstalk. Types of error & its Detection and Correction Methods. Types of data Compression Techniques.
8. **Data Link Control and Protocol: (3 hrs)**  
Flow Control: Stop - & Wait, Sliding Window, Error Control: Automatic Repeat Request (ARQ), Stop – and Wait ARQ, Sliding Window (ARQ). Asynchronous & Synchronous Protocols and its types.
9. **Multiplexing & Switching: (5 hrs)**  
Multiplexing types and Application, Multiplexing Vs Non- Multiplexing, The Telephone System: Analog services and its Hierarchy, Digital services and it's Hierarchy, Circuit Switching, Packet Switching, Message Switching, and Private Branch Exchange.
10. **Data Encoding & Modulation: (6 hrs)**  
Encoding Vs Modulation, Encoding of Digital Data as Digital Signals & its Techniques. Amplitude, Frequency, and Phase Shift Keying. Pulse Code and Delta Modulation. Analog Modulation (Amplitude, Frequency, and Phase Modulation)
11. **Modems: (3 hrs)**  
Digital Modulation Methods, Types and Standard Modems, Multilevel Modulation. Differential PSK, QPSK Modem, Higher- Data Rate Modems.

**Laboratory:**

*(The ability to complete the lab projects will depend on the facilities, availability of components, and time allocated to lab work. These projects are representative of the theory: Simulated USING MATLAB/other programming languages).*

1. Signal Analysis using MATLAB ( Maximum 3 – Labs)
2. Analysis of Signal response using simple filters
3. Simulated simple PCM coder that converts samples into a digital code.
4. Amplitude Modulation and Demodulation.
5. Frequency Modulation and Demodulation.
6. Simulated Error Control Coding techniques.

**Text Books:**

1. U.D. Black, *Data Communications and Distributed Networks*.
2. William Stallings, *Data and Computer Communications, fifth edition*.
3. Behrouz Forouzan, *Introduction to Data Communications and Networking*.
4. A. Oppenheim, *Signals and Systems*.