

DIGITAL TRANSMISSION SYSTEMS AND NETWORKS

The course starts with the discussion of various signal types and system types in a modern telecommunications network. It then discusses the two most important processes (modulation and multiplexing) used in digital networks. Voice digitization is discussed in detail. Digital hierarchy required for digital networking, and digital equipment at various point of the network are also discussed.

Audience:

This course is important for managers, sales forces and technical persons in the telecommunications field to become familiar with the digital communication systems and networks. This course is basically designed for technical persons, however, it can be easily modified and tailored for managers and sales and marketing persons.

Prerequisites:

There are no prerequisites for this course.

Objectives:

At the conclusion of this course the student will be able to describe the:

- End-to-end connection of a digital network
- Various signal types and the processes required to transport them
- Modulation technology for properly preparing a signal for transport
- Multiplexing technology for effective usage of network bandwidth
- Voice digitization technologies for various applications
- Digital hierarchy, e.g., T1, T1C, T2, T3, etc.
- Various network components and their functions

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COURSE OUTLINE

Day 1

1. Architecture

- Service
- Access
- Network

2. End-to-End Connection

- User / DTE
- Network / DCE
- Host, Server / DTE

3. Signal Types

- Signal characteristics
- Voice-frequency signals
- Data signals
- Analog vs. digital
- Signal bandwidth
- Electrical, optical and radio signals

4. Systems

- Bandwidth
- Signals and systems

5. Connection Considerations

- Bandwidth budgeting
- Power budgeting
- Section Review: Q&A

6. Multiplexing Conventions

- Frequency Division Multiplexing (FDM)
- Time Division Multiplexing (TDM)
- Statistical Multiplexing (Stat Muxing)

7. Bandwidth Management for Analog Signals

- Modulation
- Frequency division multiplexing

8. Bandwidth Management for Digital Signals Modulation

- Time division multiplexing
- Section Review: Q&A

9. Voice Frequency Signal

- Analog to Digital Conversion
- Pulse Code Modulation
- ELP Methodologies

10. Speech Encoding

- Pulse code modulation (PCM)
- Differential PCM (DPCM)
- Delta modulation (DM)
- Hybrid Speech Encoding
- Section Review: Q&A

Day 2

11. Plesiochronous Digital Hierarchy (PDH)

- The mu-law digital hierarchy
- The A-law digital hierarchy

12. SONET/SDH Digital Hierarchy

- SONET hierarchy
- SDH hierarchy

13. Digital Network Components/Functions

- Digital channel bank (PCM mux)
- Integrated digital loop carrier systems
- Add-drop multiplexer
- Digital cross-connect systems
- Regenerators
- Section Review: Q&A

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14. Network Performance

- Signal-to-noise ratio (S/N)
- Bit error rate (BER)
- S/N and BER

15. Error Control

- Three areas of coding applications
- Need for error control
- Principle of error control
- Various error control methods