

**Course Name:** Transport Fundamentals

**Course Overview:** In the class you will learn the differences between numerous types of transport systems ranging from copper, fiber and RF based or wireless networks. These systems have carried voice traffic for years, but with the on-set of modern advanced services there needs to be a change in how these systems are installed and maintained. Between bandwidth intensive services and advanced compression techniques, there is no tolerance for errors or intermittent problems. This course is designed to teach the basics of signals like DS1, DS3 and SONET, but also focuses on modern Installation and Maintenance techniques to ensure quality service.

**Course Length:** 3 days

**Who should attend:**

- Technicians
- Design Engineers
- Managers/Field Supervisors
- Field Engineers
- Installers
- Project Planners
- Data Specialists

**You will learn:**

- Understand the basic steps in building DS1, DS3 and SONET based signals
- Why modern services require advanced testing techniques
- Set up, operate and interpret results on standard test equipment
- Efficiently install and test new transport systems
- Verify proper configurations and equipment options
- Troubleshoot existing systems to ensure signal quality
- Effectively work with providers to verify service and quickly isolate problems
- Perform both link testing as well as channelized testing

**Prerequisites:** None

**Customizable:** Yes



## Course Content:

### Transport Systems

- Copper, Fiber & Wireless
- Speeds and Capacities
- Basic steps to building DS1, DS3 and SONET based signals

### DS1 Basics

- Applications
- Basic speeds/abilities
- DS1 Network Equipment
- Analog vs Digital
- PCM & TDM
- Multiplexing the signal
- Framing (ST/D4, ESF)
- Line Coding (AMI, B8ZS)

### DS1 Installation and Maintenance

- Types of test equipment
- Equipment operation & setup
- Connections to a DS1/T1
- BERT and Stress Patterns
- DS1 Test Access
- Test parameters
- Tests Types & Techniques
- Monitoring Alarms & Errors
- Loop v/s End-to-End Testing
- Monitoring Active T1s
- Maintaining T1 Networks

### DS1 Channelized Testing

- Monitoring DS0s from DS1s
- Fractional DS1/T1s (FT1)
- Drop and Insert testing

### Overview of HDSL/2/4

- Why HDSL?
- Applications
- Trends

### DS1 Service through HDSLx

### HDSL/HDSL2/HDSL4 Basics

- HDSL Network Equipment
- Conversion Process
- Distances, Parameters

### HDSL Installation & Maintenance

- Qualifying the Loop/Cable
- Verifying DS1 service
- HDSL Test Access
- Types of Tests
- Monitoring Alarms and Errors
- Testing from Line Cards

### DS3 Basics

- Applications
- Basic speeds/abilities
- DS3 Network Equipment
- Channelized and Non-Channelized
- Multiplexing the signal
- Framing (M13, C-BIT)
- Line Coding (B3ZS)

### DS3 Installation and Maintenance

- Types of test equipment
- Equipment operation & setup
- Connections to a DS3/T3
- BERT and Stress Patterns
- DS3 Test Access
- Test parameters
- Tests Types & Techniques
- Monitoring Alarms & Errors
- Loop v/s End-to-End Testing
- Monitoring Active T3s
- Maintaining T3 Networks
- DS3 Channelized Testing
- Monitoring DS1s and DS0s
- Drop and Insert Testing



## Fiber Optic Basics

- Fiber Based Networks
- Fiber Cable Basics
- Fiber Types
- Applications

## SONET Basics

- Applications
- Basic speeds/abilities
- DS3 Network Equipment
- Concatenated v/s Non-Concatenated
- Multiplexing the signal
- Framing (STS)
- STS, SPE, and OC-x
- SONET Framing/ Overhead
- Section, Line, Path
- Building the Signal

- SONET Rates and capacity
- SONET systems
- Linear v/s Rings
- Ring Types

## Basic SONET Installation and Maintenance

- Types of test equipment
- Equipment operation & setup
- Test Access
- Test parameters
- Tests Types & Techniques

## WDM/DWDM Overview

## Next Generation Backhaul Transport System

