

Objective:

To provide a complete overview of fiber optic technologies.

Course Type:

eLearning

Target Audience:

This course is designed for students who require an in-depth review of fiber optic technologies, concepts and principles.

Prerequisite:

Candidates should possess a solid understanding of the basics of data communications.

Course Description:

This course offers a comprehensive and highly technical overview of fiber optic communication systems with special emphasis on SONET/SDH and dense wavelength division multiplexing (DWDM).

TOPICS COVERED

INTRODUCTION TO FIBER OPTICS

Fiber in the telephone network

- Introduction to Fiber Optics
- Introduction to Synchronous Optical Network (SONET) and Wavelength Division Multiplexing (WDM)
- Some useful charts

TIME DIVISION MULTIPLEXING

The Path to SONET

- The path to SONET
- Quantizing

Voice compression standards and digitization

- Digitization of voice
- Voice compression standards

Time Division Multiplexing (TDM)

- Time Division Multiplexing (TDM)
- DS-1 frame

Two-stage multiplexing

- Two-stage multiplexing
- T1/T3 multiplexer (M13)

SYNCHRONOUS OPTICAL NETWORK (SONET)

Why SONET?

- Why SONET?
- Asynchronous fiber system
- Synchronous optical network
- One level of multiplexing
- SONET multiplexing chart

SONET fundamentals

- Ability to add new services
- STS-1 frame

SONET section, line and path

- SONET section, line and path

SONET layers, overhead and operations

- SONET layers
- SONET overhead and operations

SONET overhead bytes

- SONET OAM&P

STS-1 path overhead (POH) and bytes

- STS-1 path overhead (POH)
- POH bytes, B3 interleave and parity

STS-1 line overhead (LOH)

- STS-1 line overhead (LOH)
- H1/H2 pointers
- Line overhead (LOH) bytes
- SPE Timing Justifications

STS-1 Section Overhead (SOH)

- STS-1 Section Overhead (SOH)

SONET Failure Conditions

- Overview of OAM&P

SONET alarm indicators and management

- SONET alarm indicators and signals
- SONET management information

SONET ARCHITECTURES

SONET equipment

- SONET ring
- SONET regenerator
- SONET add/drop multiplexer
- Other SONET equipment

SONET Multiplexing

- Two-stage interleaving
- Single-stage interleaving
- STS-3 frame

Concatenation

- Concatenation
- STS-3c frame

Transporting and virtual tributaries

- Transporting
- Virtual tributary

Synchronous Digital Hierarchy (SDH)

- Synchronous digital hierarchy (SDH)

SONET network architectures

- SONET network architectures
- Point to point system with ADM
- From ADM point to point to ring
- Standards-based survival rings
- Automatic protection switching (APS)

Two fiber and four fiber OC-48

- Four fiber OC-48 ring
- Two fiber OC-48 ring

Multiple ring network and other architectures

- Multiple ring network and other architectures

FIBER BASICS

Fiber basics

- Fiber basics and uses
- Fiber transmission characteristics
- Fiber system components

Fiber optic transmitter

- Principle of transmission in fiber

Transmission in fiber

- Transmission in fiber

Fiber optic light sources

- Fiber optic light sources
- LEDs and other laser diodes
- Semiconductor lasers

Detection devices and systems

- Detection devices and systems
- Photodiode detection systems and semiconductors

FIBER TRANSMISSION TECHNOLOGIES

Fiber types

- Fiber types
- Multimode fiber
- Singlemode fiber

Fiber applications and construction

- Fiber applications
- Fiber cable construction

Preform

- Manufacturing preform

Fiber cable testing and measurement

- Fiber cable testing and measurement
- Optical and geometric testing
- Environmental and mechanical testing

FIBER CABLING ISSUES

Cabling and cable types

- Cabling and physical issues
- Cable types

Splicing and connectors

- Fiber connectors
- Splicing

FIBER TRANSMISSION ISSUES

Fiber transmission issues

- Dispersion
- Polarization mode dispersion

Attenuation

- Attenuation

Test equipment

- Test equipment
- Use of OTDRs
- Optical spectrum analyzer

Fiber Optic Technologies



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FIBRE NETWORK PLANNING

Power and bandwidth budget

- Power budget
- Bandwidth budget

DENSE WAVELENGTH DIVISION MULTIPLEXING (DWDM)

Dense wave division multiplexing

- DWDM introduction

DWDM major components

- DWDM major components

Optical amplifiers

- Optical amplifiers

Optical multiplexers

- Optical multiplexers - dielectric
- Optical multiplexers – planar waveguides
- Optical multiplexers – fiber based components

Modulators and Bragg gratings

- Mach Zender modulator and Bragg gratings

Wavelength add/drop

- Wavelength add/drop

Dense Wavelength Division Multiplexing (DWDM) fiber types

- DWDM fiber types

DWDM non-linear effects

- DWDM issues and four wave mixing (FWM)
- Self phase modulation (SPM) and Cross phase modulation (CPM)
- Stimulated scattering and amplified spontaneous emissions

THE OPTICAL NETWORK

Optical networking overview

- Optical networking
- Path in lambda

DWDM optical rings

- DWDM optical rings
- DWDM Wavelength leasing, metro network, and future

NETWORK PROTOCOLS ON FIBER

Network protocols over fiber

- Asynchronous transfer mode (ATM)

Packet over SONET

- IP on POS, gigabit Ethernet and multiple DWDM protocols

EXISTING OPTICAL NETWORKS

Current optical networks

- Current optical networks