

Hands-On

# Fiber Optics for Today's Industry Applications

(A Non-Telephone Company Course)



## Course Description

This Hands-On course is designed to provide technicians with a practical understanding and Hands-On Experience of fiber optic theory and fiber optic applications.

This would include using Fiber Optics for

- Digital Control Systems (DCS )
- Networks (LANS/WANS/CANS/MANS)
- Security & Traffic Systems
- Closed Circuit TV systems
- Industrial Manufacturing Monitoring Equipment
- Data and Voice Networks
- Multitude of Other Fiber Applications

This in-depth course focuses on a wide array of Fiber Optic systems and components and will focus on installation, splicing, connectorization, testing and maintenance techniques that will prepare each student to skillfully work with fiber optics in a wide variety of commonly found work conditions. This course relies heavily on hands-on exercises and student participation, It begins with an explanation of light and fiber optic theory and then moves on to Hands-On and practical applications of installing and maintaining a complete fiber system.

## Students Will Learn

- The History Of Fiber Optics & Evolution Of Fiber Systems.
- Fiber Optic Theory And Waveguide Functions.
- Singlemode And Multimode Fiber Types.
- The Causes Of Attenuation, Optical Reflection And Refraction.
- Optical Dispersion Characteristics And Pulse Spreading Issues.

- Loose Tube And Unitube Style Trunk Cables
- Distribution And Feeder Cables.
- Fusion Splicer Applications And Fiber Alignment Systems
- Mechanical Splicing Uses And Applications
- Optical Connector Styles And Applications
- Back Reflection Issues And Angled Physical Contact Connectors
- Patch Panels And Functions For Distribution And Transmission
- Splice Closure Styles And Function
- Drop Cable Connectivity And Security
- Safety Practices
- Intro To Optical Testing And Troubleshooting.
- Visible Light Sources, OTDRs And Power Meters
- Testing Methods For Singlemode And Multimode Fiber Systems
- OTDR Test Functions And Trace Interpretation
- Optical Loss Testing Methods
- And More

## Target Audience

Inside /Outside, Plant technicians, contractors, union craftsman, electricians, technicians, installers, splicers, engineers, facilities managers, managers and anyone involved in repairing, installing, maintaining, designing, evaluating, or provisioning Fiber Optic Cables and Optical Networks.

## Prerequisites

None.

## Course Outline

## I. INTRODUCTION

- Common Industry Terminology
- History of Fiber Optics
- Advantages/Disadvantages of Fiber Optics
- Basics of a Fiber Optic Communications System
- Typical Transmission Rates for Voice, Video & Data Applications
- System Topologies
- Fiber Optic Standards
- And More...

## II. THEORY TOPICS

- Theory of Light
- Electromagnetic Spectrum
- Total Internal Reflection (Singlemode)
- Refraction (Multimode)
- Index of Refraction (Refractive Index)
- Light Source's (LED's & LASER's)
- Wave Division Multiplexing (WDM)
- Optical Switching Fundamentals

- And More...

### III. FIBER TOPICS

- Optical Fiber Types
- Typical Fiber Specifications
- Multimode Optical Fibers
- Singlemode Optical Fibers
- Dispersion Characteristics
- Modal Dispersion
- Chromatic Dispersion
- And More...

### IV. FIBER CABLE TYPES

- Outside Plant
- Inside Plant
- Loose tube Gel Filled
- Tight Buffered Distribution
- Tight Buffered Breakout
- Jumper Cables and Hybrids styles
- Reverse Oscillation Locator

- Fiber Color Code
- And More...

## MODULE #2

## FIBER OPTIC SAFETY ISSUES

### SAFETY FIRST

- LASER Safety and Warning labels
- Types of LASER's
- LASER Output Power Levels
- Eye Safety Precautions
- Safe Glass Disposal Practices
- Food and Drinks Not Safe
- Proper Person Cleanliness
- Safe Work Surroundings
- Confined Spaces Issues
- And More...

## MODULE #3

## FIBER OPTIC CABLE INSTALLATION

### PROPER PLANNING

- Project Considerations

- Cable Pre-testing
- Cable Reels Identification and Handling
- Proper Cable Pulling Techniques
- Outdoor Cable Design Characteristics
- Cable Pulling Specifications
- Tensile Strength and Bend Radius
- Avoiding Installation Obstacles
- Grounding and Bonding Fiber Cables
- Identifying Cable Types
- Work Area Protection Issues
- And More...

## MODULE #4                      CONNECTORIIIZATION

### INSTALLING AND TESTING CONNECTORS

- How to inspect connector endface
- Proper handling and cleaning connectors
- Install connector on 900u buffer
- Install connector on 3mm patchcord
- How to test connectors with PM & LS

## MODULE #4                      FIBER OPTIC TESTING

## ADVANCED TESTING INFORMATION

- The dB Scale and Units of Loss
- OTDR Functions for Testing
- OTDR Testing for Splices, Distances and Back Reflection
- OTDR Trace Guidelines
- The Dead Zone
- Trace Events and Interpretation
- Testing at Various Wavelengths
- System Loss Parameters
- Calculating System Loss
- Total System OTDR Testing
- Optical Loss Test Set's (OLTS)
- Referencing the Test Set First
- Measuring Cable System Loss
- Documenting Test results
- And more...

## Notes

### Hands-On Labs

Safety Concerns with Hands-on Practices  
Cable Types (Uni-tube & Loose Tube)

Practice Safe Cable Preparation Techniques  
Various Closure Types  
Practice Closure Preparation  
Install Prepared Cable into Closure  
Practice Fiber Routing to Splice Trays  
Patch Panel Types and Fiber Dressing  
Fusion Splicer Types and Operations  
Mechanical Splice (Fiber Lok)  
Precision Cleaver Operation  
Set-up Fusion Splicer and Cleaver Work Stations  
Practice Fiber Stripping, Cleaning and Cleaving  
Practice In-Line Fusion Splicing  
Practice Pigtail Fusion Splicing  
Qualify Acceptable Fusion Splices  
OTDR Operation and Theory  
Practice OTDR Set-up Procedures  
Practice OTDR Splice and Connector Testing  
Measure Fiber Lengths, Events and Losses  
Measure Reflectance for Acceptance  
Install and Polish connectors  
Inspect connector endface  
Proper procedures for handling connectors  
Perform loss testing with OTDR  
Perform loss testing with Power meter & Light Source  
Practice Troubleshooting Techniques  
And more

## Delivery Method

Instructor-Led with numerous Hands-On Labs and exercises.

## Equipment Requirements

(This apply's to our hands-on courses only)



BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

## Course Length

2 Days