

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

### **MODULE #1                      FIBER OPTIC GENERAL STUDIES REVIEW**

#### **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 Sources (LEDs & LASERs)  
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 LASERs

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                    CONNECTORIZATION**

### **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 Sets (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**

3 Days