Fiber Optics for Utilities

Foundational | Intermediate | Advanced

Level 1 Technician

This three-day instructor-led course teaches basic fiber optic theory and the products used in fiber networks, focusing on the proper installation and maintenance of aerial and underground utility fiber optic systems. Hands-on skills training includes splicing, termination, testing, and troubleshooting to increase efficiency, reliability, and deployment speed in the field.

Audience: Installers and technicians in the utility telecom industry

Prerequisite: Fiber Foundations is recommended, but not required.

Level 2 Designer

This one-day course examines fiber optic design parameters, cable management alternatives, route planning, optical testing requirements, test results interpretation, and cable system design.

Audience: Those involved in the design, administration, operation, and supervision of utility-based fiber optic networks

Prerequisite: Any Light Brigade foundational course like Fiber Optics 1-2-3, online training, or equivalent field experience

Level 3 Adv. Designer

This one-day course focuses on DWDM systems and transmission impairments such as PMD and CD that limit the bandwidth and operating rates of fiber optic transmission systems. It covers xWDM theory and applications with a special emphasis on fiber dispersion limits and system design considerations.

Audience: Design engineers, or project managers

Prerequisite: Knowledge of fiber optic theory, plus field experience or formal training such as Fiber Optics for Utilities Level 2 Designer

Click or scan for detailed course information and upcoming training locations.

Credentialing

UTC Fiber Optic Professional

Valid for three years.

Light Brigade Digital Badge

Complete this course and receive a Credly digital badge.

"The instructors were great at presenting the material. They showed us better ways to terminate."

—Travis Buenning, AEP

For training, tools, or equipment:

1 (206) 575-0404 • 1 (800) 451-7128 • lightbrigade.com

Light Brigade®

UTC Fiber Optic Professional Level 3 Advanced Designer

Detailed Course Outline

Light Brigade®
FIBER OPTIC TRAINING

This one-day technical primer focuses on dense wavelength division multiplexing (DWDM) systems and transmission impairments such as PMD and CD that limit the bandwidth and operating rates of fiber optic transmission systems. The course will give participants a solid understanding of how this technology works from theory to applications with special emphasis fiber dispersion limits and DWDM system design considerations.

Prerequisites: This course requires knowledge of fiber optic theory, as well as field experience, equivalent formal training such as the Fiber Optics 1-2-3 course or viewing the Light Brigade Staff Development videos.

Certifications and Credits: UTC Fiber Optic Professional Level 3 Advanced Designer certification
Light Brigade Digital Credentialing

Classroom Topics

Introduction
- The three big issues
- Four tiers of fiber industry providers
- Optical units
- Optical network evolution
- New and future bandwidth demands
- Evolving to the all-optical network

System Overview
- Optical fiber transmission
- Common data communication protocols
- SONET optical carrier rates
- Standards committees

Optical Theory
- Lightwave transmission
- Dispersion
- Fiber optic system basics
- Pulse spreading
- Birefringence in fiber
- Time domain multiplexing systems
- Wavelength dimension in WDM systems

Optical Fibers
- Fiber composition
- Mode field diameter
- Single-mode optical fibers
- ITU-T G.652 single-mode fiber
- ITU-T G.653 dispersion-shifted fiber
- Four wave mixing
- ITU-T G.655 nonzero dispersion-shifted fiber
- Dispersion-compensating fiber

Active Devices
- Light sources – lasers
- Fabry-Perot lasers
- Distributed feedback lasers
- Laser spectral width
- Direct versus indirect modulation
- Pulse chirping
- Tunable lasers
- Optical isolators
- Optical return loss and the ODN
- Reflection causes and issues
- Fiber optic cleaning methods
- Laser safety
- Photodiodes
- Detector types
- Materials used in detectors
- BER, transmission speed, received power
- Single-mode system loss budgets

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Regeneration
- Repeaters and regenerators
- Basic components for optical transmission
- DWDM system spans
- Optical amplification
- Erbium-doped fiber amplifiers
- Four-channel DWDM with optical amplifier
- Semiconductor optical amplifiers
- Amplification loss budgets

Optical Multiplexing
- Fiber optic passive devices
- Active devices used in WDM systems
- Multiplexing basics
- Wavelength division multiplexing
- Coarse wavelength division multiplexing
- Dense wavelength division multiplexing
- Common DWDM components
- Multiplexing optical sources
- Fiber optic transponders
- Optical demultiplexing
- Fiber Bragg gratings
- Optical circulators
- New components in transition
- Optical amplifiers
- Fiber optic specifications
- OLS channels and power levels
- DWDM architectures
- DWDM system design considerations

Dispersion
- Dispersion formulas
- Dispersion power penalties
- Modulation
- Chromatic dispersion compensation
- Dispersion compensating modules
- Pulse compression and broadening
- Pulse appearances
- Calculating dispersion penalty

Chromatic Dispersion
- Components of chromatic dispersion
- Chromatic dispersion measurement
- Spectral group delay in the time domain
- Modulated phase shift method
- Differential phase shift method
- Interferometry method

Polarization
- Polarization mode dispersion
- Linear polarization states
- Polarization and components
- Polarization theory
- Elliptical nonlinear polarization
- Elliptical polarization
- Circular polarization
- Polarization-dependent loss
- Polarization controllers
- PMD measurement methods

Test Equipment
- Test and equipment
- Wavelength isolating power meters
- The reflectometer
- The OTDR
- OTDR testing for reflections
- Reflection testing
- Optical spectrum analyzers
- Multiwavelength meters
- Testing WDM networks
- End-to-end testing
- Optical dispersion testers
- Chromatic dispersion testing
- Pre and post CD measurements
- Polarization mode dispersion testing
- Simple PMD calculations
- Complete PMD fiber characterization
- PMD first order limits

The Future
- 40/100G transmission
- Optical switching types applications
- ROADMs
- Wavelength selectable switches
- Optical switch manufacturers
- Frequency tunable components
- Future trends
- The physical plant

Light Brigade®