



Course 803: Fiber Optic Communication (3 days)

Course Description...

The majority of today's data, for enterprises and individuals, are transported on fiber optic communication systems. Using the latest advances, fiber optics can provide practically unlimited information capacity and can span any distance. This course starts from the basics of communication and then logically and quickly provides a comprehensive knowledge base in this essential communication technology. Discussions include all aspects of fiber optic systems, including the business case, the technical fundamentals, deployment fiber optic systems and the latest advances.

Learning Objectives...

- ❑ Understand basic terminology and concepts and take the lead in fiber optic discussions
- ❑ Compare and contrast the features, functions, benefits and challenges of fiber optic communications with other wireline and wireless solutions
- ❑ Match communication requirements with feasible fiber optic systems
- ❑ Specify optical fibers, cables, connectors, splices, and other transmission equipment
- ❑ Participate in or manage all aspects of the fiber optic system life cycle from planning through design, installation, maintenance, upgrading and troubleshooting
- ❑ Identify when and how to test fiber optic systems by use of power meters and OTDRs
- ❑ Stay current as fiber optics evolves to higher performance and greater market penetration

Who Should Attend...

- ❑ Prerequisites: none, except for an interest in understanding this important technology
- ❑ Non-technical personnel who wish to understand the business case and market opportunities for fiber optic communication and acquire the knowledge required for sound planning and decision making. (Line and staff management, contract and personnel supervisors, marketing and sales employees, finance specialists,...)
- ❑ Technical personnel will develop a detailed understanding of the fundamental mechanisms of fiber optic technology and learn how to specify, design and deploy practical fiber optic communication solutions. (Technical staff and managers, engineers, technicians, system administrators,...)



Course Outline:

Section 1: The Business Case for Fiber Optic Communication

- a) Role and types of communication networks
- b) Bandwidth requirements
- c) Bit error ratio
- d) S/N and BER prediction and threshold
- e) System component overview
- f) Survey of fiber-optic solutions

Section 2: Optical-fiber light-guides,

- a) Light wave metrics and terminology
- b) Guiding light: the role of refraction and reflection
- c) Fiber profiles: step, graded and high-performance
- d) Benefits, challenges and markets: multimode and singlemode fibers
- e) Numerical aperture functions, types and markets
- f) Computational methods for determining modal behavior
- g) The role of the V parameter
- h) Manufacturing optical fibers

Section 3: Light-guide limitations: attenuation and bandwidth

- a) Communication power and channel loss
- b) The fiber-optic windows
- c) Fiber attenuation: causes, effects and management
- d) Backscatter
- e) Explaining and predicting Rayleigh scattering and infrared absorption
- f) Managing microbending, macrobending and temperature cycling challenges
- g) Field testing tips and techniques
- h) Latest advances: C, L, S, X bands...

Section 4: Transmission equipment

- a) Sending and receiving data in lightwave form
- b) Transmitter features, benefits and challenges: LEDs and lasers
- c) Photodetector receivers: PINFETs and APDs
- d) Examples of practical systems
- e) Predicting signal to noise ratio: a computer tool
- f) Latest advances: tunable lasers, VCSELs, coherent detection...

Section 5: Connectors and splices

- a) Managing this significant challenge
- b) Specifications and terminology
- c) Managing Fresnel reflection
- d) Identifying and treating mismatched fibers in the field
- e) Predicting loss due to mismatched fibers: a computer tool
- f) Splicing tips and techniques
- g) Connectors tips and techniques
- h) Latest advances: fiber ribbons, APC, opto-isolators...



Section 6: Designing, installing and managing a fiber optic communication solution

- a) Role of structured cabling
- b) Long-haul systems
- c) Managing power and loss: the power budget
- d) Power budget: a computer tool and case studies
- e) Dispersion causes and effects: chromatic and multimode
- f) Fiber and system bandwidth
- g) The importance of managing fiber and system bandwidth
- h) Determining fiber and system bandwidth: a computer tool and case studies
- i) Latest advances: EDFA and Raman optical amplifiers, passive optical networks, dispersion compensation

Section 7: Understanding and selecting fiber optic cables

- a) Cable elements and nomenclature
- b) Indoor cabling challenges and solutions
- c) Satisfying the fire code
- d) Outdoor cabling: aerial, direct burial and ducts
- e) Installation tips and techniques
- f) Acceptance testing standards
- g) Blown fiber installation alternative

Section 8: Maintenance and troubleshooting tips and techniques

- a) Optical Time Domain Reflectometer: a powerful tool
- b) Using the OTDR: obtaining traces
- c) OTDR trace interpretation
- d) OTDR trace interpretation case studies
- e) Diagnosing malfunctioning systems
- f) The role of loss, noise and dispersion
- g) Troubleshooting examples

Section 9: Upgrade strategies to extend the lifetime of fiber optic infrastructures

- a) Dense wavelength division multiplexing
- b) Moving to 40 Gb/s and beyond
- c) The role of dark fiber
- d) When to transition to singlemode fiber

Section 10: Future markets and emerging technologies

- a) Optical switching
- b) Optical routing
- c) Soliton transmission
- d) Fiber to the home

Please contact your ROI representative to discuss course tailoring!!!