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Telecomms Trining Programe

Basic Fiber Optics

Course Objectives:

On completion of the course the trainee/s will be competent in:

- The basics in Fiber Optic technology leading to more advanced levels

Course Duration: Five Days

Course Contents:

- Introduction to Fiber Optics Technology and Technical applications
- Technical Overview
- Systems Appreciation
- Quality Standards and Quality Assurance
- Fiber Optic system components and configurations
- Cabling and Jointing
- Splicing and Testing
- Checking Effectiveness
- System testing equipment
- Basic theory of system design and installation
- Applied Castings for system
- Work practices and standards
- Safety Implications: Assessment and Precautions
- Practical applications and installations, termination's and testing
- New Technology Available and Under Research
- Case studies,
- Exercises
- Group discussions periods
- Course Evaluation
- Course Summary

Who should attend:

Newly appointed Fiber Optic engineers and technicians with a basic background in electronics or communications engineering.

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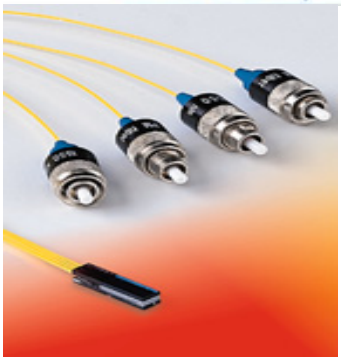

Fibre Optics Course (Part One) Designing & Installation

INTRODUCTION

In recent years it has become apparent that fibre-optics are steadily replacing copper wire as an appropriate means of communication signal transmission. They span the long distances between local phone systems as well as providing the backbone for many network systems. Other system users include cable television services, university campuses, office buildings, industrial plants, and electric utility companies.

This is a 3-day theory overview of fibre-optic technology, telecommunication applications, fibre-optic advantages and disadvantages, and fibre-optic economics.

It explains in detail all about Fibre Optics. It deals with a whole raft of practical issues that any aspiring fibre optic engineer needs to have a firm grasp of, before undertaking fibre optic projects, whether they be small data networks or internal communication links or large long distance projects in harsh conditions. It is designed as the foundation course leading to further study and hands-on practical workshops.

Throughout the course students will be given reading material and periodic revision/testing to confirm their understanding of the subjects covered.

Course Objectives

On completion of the course students will be knowledgeable about:

- The underlying concepts of Fibre Optic technology
- Understanding the various FO types and their use
- Connectors and splicing
- How to make FO calculations
- What is necessary to test and install Fibre
- Test equipment and procedures
- The safety precautions and procedures involved with handling fibre.
- How fibre is made

Course Duration **Three Days**

COURSE PROGRAMME

Day 1

Session 1 - Understanding the Jargon

- Fibre Glossary
- Why Fibre?
- Standards
- History

Session 2 - All About Fiber

- Fibre Structure
- Fibre Types
- Geometry, Attenuation & Bandwidth
- Sources for loss measurements
- Modal effects on attenuation
- Modal distribution
- Sources & Mode Modifiers
- Cladding mode strippers
- Mode scramblers
- Mode filters
- Bending losses
- Introduction to ODTR

Session 3 - Cables and Cabling Networks

- Choosing a cable
- Cable types
  - Simplex & Zipcord
  - Distribution cables
  - Breakout cables
  - Loose Tube cables
  - Others
- Cable ratings & markings
- Pulling FO cable
- Safety
- Designing Systems & Networks
- Cable Management
- Fibre Count
- Estimating & Bidding
- Contracts
- Documentation

Session 4 - Q & A Test – Day 2 look forward

Day 2

Session 1 - Terminations & Splicing

- Safety
- Connectors, SMA, ST, SC, FDDI etc
- Loss Mechanisms
- Loss testing
- Microscopic Inspection
- Durability
- Optical Return Loss
- Connectorized cable tests
- Launch cables
- ORL of cable assemblies
- Termination Procedures
- Field Termination Hints
- Splicing
  - Fusion
  - Mechanical
  - Pigtailing

Session 2 - Datalinks

- Emitters
- Detectors
- Performance perameters
- Network specifications and FO system standards

Session 3 - Testing

- Safety
- Testing and Troubleshooting
- Testing Networks
- Checking Continuity
- Measuring Power with Power meter
- Fibre Optic Loss Measurements
- Handling & cleaning procedures
- Transceiver Loopback testing
- Surviving with FO

Session 4 - Exercises - Day 3 look forward

Day 3

Session 1 - OTDRs

- Understanding ODTRs
- When to use
- How OTDRs work
- Trace Information
- Launch cables
- Ghosts
- Backscatter variability Errors
- Resolution limitations

Session 2 - How Fiber Is Made

- Core
- Chemical Reactions
- Passing the torch
- Drawing Power
- Test & Measurement

Session 3 - Calculating the link "loss budget"

- Cable Plant link loss budget analysis
- Fibre Loss
- Connector Loss
- Splice Loss
- Equipment link loss budget analysis
- Loss margin calculation

Session 4 - Exercises, Discussion & Course Wash-up

Time permitting, additional technical material can be covered.

Fibre Optics Links (Section Two)
Technology & Applications

Course Objectives:

On completion of the course students will be knowledgeable and have the practical skills in:

- The Fiber Optic technology leading to more advanced levels
- Fibre Optic tools for testing and maintenance

Course Duration: Three Days

Course Contents:

Day 1

- **Practical Terminating:**

- Loose tube cable
- Tight jacket cable
- Secondary coated cable

Day 2

- **Use of Power Meters and Light Sources:**

- Testing patchcords
- Systems testing
- Practical splicing

Day 3

- **Principles of Testing Using Optical Domain Reflectometers**

Who should attend:

Fiber Optic Engineers and Technicians with a basic background in electronics and Telecommunications.

Fibre Optics Technology (Section One)
Designing & Installation

Course Objectives:

On completion of the course the trainee/s will be competent in:

- The basics in Fiber Optic technology leading to more advanced levels
- The safety precautions involved with fibre optics

Course Duration: Five Days

Course Contents:

- **Concepts and Understanding of fibre optics:**
  - Why use fibre optics
  - Attenuation
  - Bandwidth
  - Immunity
  - Ease of Installation in various environments

- **Optic Fibre and its use in communications:**
  - Optic fibre core / cladding and misalignment
  - Single mode fibre's
  - Emitters
  - Receivers
  - Optical windows – Electromagnetic spectrum
  - Microbending – Numerical aperture index of refraction

- **Basic cable construction:**
  - Tight jacket
  - Loose tube
  - Buffered
  - Special types: Ribbon – blown fibre
  - Environmental conditions
  - Basic Parameters in settling cable

- **Termination techniques:**
  - Splicing methods - fusion – mechanical
  - Fibre Preparation
  - Fibre splicing and pigtailing

- Cleaving - various types – comparisons
- Losses
- Protecting the splice

➢ **Connecterisation**:
- Type of connectors SMA – ST – SC – FDDI Hot Melt FC/PC
- Methods dry - wet epoxy – pre-glued – crimp
- Different procedures for various cable types

➢ **Cable management:**
- Patchpanel
- Wall boxes
- Y Splitters
- Break out boxes
- Splice trays
- Enclosures

➢ **Testing:**
- The need to test
- Various areas of an installation
- Use of microscopes and the criteria for acceptance of end faces
- Use of OLTS and OTDR
- Measuring techniques for patchcords and links

➢ **Optical fibre safety:**
- Chemicals
- Optical fibre
- Optical power
- Ovens and heat guns

➢ **System design consideration:**
- Bandwidth and attenuation
- Cabling
- Fibre count

➢ **Installation specification:**
- Operational requirement
- Scope of work
- Technical specification
- Contractual requirement

Who Should Attend:

Newly appointed Fiber Optic engineers and technicians with a basic background in electronics or communications engineering.

Fibre Optics Technology (Section Two)
Technology & Applications

Course Objectives:

On completion of the course the trainee/s will be competent in:

- The Fiber Optic technology leading to more advanced levels
- Fibre Optic tools for testing and maintenance

Course Duration: Five Days

Course Contents:

- **Practical Terminating:**
  - Loose tube cable
  - Tight jacket cable
  - Secondary coated cable

- **Use of power meters and tight sources:**
  - Testing patchcords
  - Systems testing
  - Practical splicing

- **Principles of testing using optical domain Reflectometers**

Who should attend:

Fiber Optic engineers and technicians with a basic background in electronics or communications engineering.

Radio Transmission Systems - Analogue & Digital.

Course Objectives:

This course is designed to give the participants:

- An overview of the different radio communication systems and the developments in latest technologies
- The various components within the transmission systems and the planning of radio link
- The various Data Transmission & Networking System and Capabilities
- The aspects of Cable TV systems, the optimal configurations and technology capabilities

Course Duration: Five Days

Course Outline:

I.*Overview of different radio communications systems.*

* The evolution of telecommunications
* Radio Communications:
HF/VHF/UHF, Microwave Systems,

* Spread Spectrum techniques: Frequency Hopping, Time Hopping, Direct Sequence.
* Satellite Systems: Types of satellites, Orbital Considerations, Satellite Technology, * VSAT, Network management, Network Protocols, FDMA, TDMA, CDMA,
Satellite Services.

Review of basis principles

* Fundamentals of radio principles.
* Modulation Systems (Analogue & Digital)
* Electromagnetic Wave Propagation:
* Line of sight principle

* Curvature of earth propagation

Microwave Link System Equipment

* General layout of equipment
* The transmitter, the receiver
* Terminal stations
* Repeater stations
* Equipment configuration: (1+1 standby configuration, 1+1 diversity configuration)
* Intervening bands, frequency planning, and nature of information.
- Digital Microwave Radio (DMR)

* Digital Communications: Coding Techniques - Coding, Code Noise Immunity, Alpha-Numeric Codes.
* Modulation Schemes for Digital Radio Communications: PAM, QAM, PCM, FSK, **MSK, PSK.**
* Nyquist Theorem
* Codec
* PCM/TDM repeaters
* Delta Modulation
* Digital Signaling Encoding Formats
* Code Error Detection
* Telemetry
* Microwave Tubes & Devices: Magnetron, TWT (Amplifier & Oscillator), Klystron, Gunn Oscillator, IMPATT Diode, P-I-N Diode, parametric Amplifier, Maser, Laser.

II.Multiplexing

* Analogue FDM (Frequency Division Multiplex)
* Analogue TDM (Time Division Multiplex)

Digital Multiplexing:

* PCM Transmission Formats, Frame & Multiframe, Alignments, Asynchronous & Synchronous Systems, Network Node Interface, Overhead, Hierarchy, Pulse Stuffing, Location Mapping.

III.Antennas

* Antenna requirements:- gain, receiving area, beam width, polarization, bandwidth.

Antennas Types

* Dipole, helical antenna, parabolic dish antenna, end fire or cigar antenna, Yagi, horn, corner reflector antenna.

Branching circuits

* Duplexers, diplexers, multiplexers
* Filters (low-pass, high-pass, band-pass, band-stop)

IV.Link Budget Calculations

* Link Budget

* Path length and fading margin
* Radio Path Clearance
* Noise contribution
* Noise figure of a receiver
* Free space attenuation
* Receive threshold
* Link calculations

V.The path planning aspects of radio links.

* Choice of equipment
* Path profiles and site location, path length, fading margin, radio path clearance, local installation condition
* Locating radio sites
* Preliminary map study
* A link with one repeater - a link with two repeaters
* On site survey
* Complete study of the path profile
* Calculations - path profile - tower height calculations
* Freznel zone clearance
* Frequency allocation plans
* Microwave interference.

VI.Data Transmission & Networking.

* ISO & CCITT Standards
* The “Layer” System
* Protocols
* LANs
* Token Rings
* 10Base-T (Ethernet)
* Hubs & Repeaters
* FDDI
* WANs & MANs

VIICable TV.

- Spectrum Reuse
- Cable Network Design
- Signal Quality
- Cable System Trade Offs
- Hybrid Fibre-Coax
- Distribution Plant Improvements
- Signals Security System
- Tapping Systems
- Scrambling
- Digital Video Compression *DVC)

Case Studies and Exercises, supported by interactive sessions

Who Should Attend:

Technicians, Engineers and Supervisor of Radio Transmission and CCTV Systems. Also useful for Radio Systems production managers and of great interest to other personnel involved in the Radio Transmission, CCTV and High Speed Communications Industries.

Rig Telecommunications

Course Objectives:

On completion of the program the trainees will be competent in:

- Understanding, Setting up, maintaining and basic trouble shooting of rig communication systems
- Give basic analysis of why and how the rig communications systems functions and limitations
- Maintain and protect the systems from corrosive elements

Course Duration: Five days

Course Contents:

- Telecom Equipment Maintenance: Type of equipment used, basic understanding of functions, Basic Trouble shooting, Maintenance awareness, Maintenance schedules, Remote site maintenance, Corrosion effects, checks and treatment.
- Rig Communications: Introduction, Types and functions, Ariel types: microwave UHF & VHF, Freq ops, Set up, Path aligning, Equipment for aligning, Microwave path, Log Periodic (rotatable), Land based stations: capabilities and limitations, Ordering and fitting new parts
- Info. Tech. Principles (Data com)
- Working Aloft: Hazards and dangers, Safety precautions, Clothing & Equipment, Permit to work and regulatory, Mast maintenance, Tools
- required and maintenance, Inter-work communications, Control of operations
- Climbing techniques (practical exercises).
- Test Equipment: Avo-meters, Fault checking and analysis, Maintenance and use of equipment

- Digital Microwave
- Discussion groups and practical exercises to confirm abilities for outside work (each trainee to receive basic climbing certificate to climb initially under supervision)

Who Should Attend:

Potential rig and mast maintenance crewmembers, which have little or no knowledge and skills in this subject but will be, expected to work initially
under supervision and confidently climb and maintain Ariel masts.