



*Technology Training that Works*

# Practical Fibre Optics for Engineers and Technicians

## LIVE ONLINE COURSE

### THE COURSE

This course will provide you with the necessary background to understand the fundamentals of fibre optic systems and their individual components including fibres, cable construction, connectors, splices and optical sources and detectors. Various pitfalls associated with the implementation of fibre optic systems are discussed and workable solutions to these problems are provided. It will provide you with the knowledge to develop the required techniques for design, installation and maintenance of fibre optic systems.

The course places significant emphasis on the practical techniques of component installation and system design. You will have the opportunity to get hands-on experience with mechanical and fusion splicing and with fitting the popular industrial fibre connectors. A fibre optic link design software package is also provided to allow you to practice actual link design practicals using various parameters.

### OBJECTIVES:

At the end of this course, you will be able to:

- Specify and describe fibre optic communications systems in total
- Apply state of the art fibre optics technology and installation practices
- Apply hands-on experience in jointing, splicing and testing fibre optic systems
- Use correct procedures for cable installation and termination
- Design and install a fully operational fibre optics system
- Demonstrate new approaches to troubleshooting

### WHO SHOULD ATTEND?

- Consulting engineers
- Control engineers and technicians
- Electrical engineers
- Instrumentation engineers
- Instrumentation technicians
- Maintenance engineers and technicians
- Process control engineers
- Project engineers
- Project managers
- Systems engineers
- Telecommunications engineers

### PRE-REQUISITES:

Fundamental grounding in basic electrical engineering concepts.



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## **COURSE OUTLINE**

This is an intensive online course. The course is split up in to two sections – Live sessions and recorded lectures. All 8 hours will be provided upon course completion for review.

### **LIVE SESSIONS**

#### **SESSION ONE**

##### **OPTICAL DRIVERS AND DETECTORS**

- Light emitting diodes
- Lasers
- Transmitters modules
- Safety considerations
- PIN photodiodes
- Receiver modules
- Optical amplifiers

#### **SESSION TWO**

##### **INSTALLING FIBRE OPTIC CABLES**

- Initial preparation – site survey/design
- General installation rules and procedures
- Bending radius/cable tension/cable reels
- Cable trays/conduits/lubricants
- Indoor cable installation/leaving extra cable
- Outdoor cable installation/environmental conditions
- Splicing trays/organisers/termination cabinets/patch panels/distribution panels/breakout boxes

#### **SESSION THREE**

##### **FIBRE OPTICS SYSTEM DESIGN**

- Initial design considerations
- Future capacity/reliability/operation wavelength
- Repeaters and amplifiers
- Design loss calculations/link loss budgets
- Design bandwidth calculations

#### **SESSION FOUR**

##### **TESTING OF FIBRE OPTIC SYSTEMS**

- Concepts of optical measurement
- Continuity testing
- Insertion loss testing
- Optical Time Domain Reflectometry (OTDR)
- Bit Error Rate (BER) testing
- Eye diagrams
- Laboratory fibre tests



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## **TECHNOLOGIES THAT USE OPTICAL FIBRES**

- Low speed modems
- 10 base F/FDDI/FIOLR
- ATM
- LANs/MANs/WANs
- Analog modulators for video and microwave links
- HDTV

## **RECORDED LECTURES**

### **RECORDING ONE**

#### **INTRODUCTION TO FIBRE OPTICS SYSTEMS**

- Introduction
- Historical background to fibre optics
- Comparison of fibre optics and copper systems

### **RECORDING TWO**

#### **DEFINITIONS, BASIC PRINCIPLES**

- Data communications
- Communications channels
- Transmission modes
- The electromagnetic spectrum
- Revisiting copper

### **RECORDING THREE**

#### **THEORY OF FIBRE OPTICS TRANSMISSION**

- Fundamental principals of operation
- Light transmission nature of glass
- Numerical aperture
- Modal propagation in fibres
- Multimode/singlemode/step-index/graded index
- Bandwidth of fibres
- Modal and chromatic dispersion
- Absorption/scatter/bending/radiation/mismatches
- Other types of fibres

### **RECORDING FOUR**

#### **CONSTRUCTION OF FIBRE OPTIC CABLES**

- Cable objectives
- Tensile ratings
- Structural elements
- Housings – loose tube/slotted core/tight buffered
- Sheaths and moisture barriers
- Classes of cables – aerial/underground/subaqueous/indoor



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## **RECORDING FIVE**

### **CONNECTING FIBRES**

- Optical connection issues
- Fibre end preparation
- Splicing fibres – fusion/mechanical
- Connectors
- Optical couplers