PRACTICAL
FIBRE OPTICS AND INTERFACING TECHNIQUES
TO INDUSTRIAL ETHERNET AND WIRELESS

YOU WILL LEARN HOW TO:

- Practical hands-on experience in jointing, splicing and testing fibre optic systems
- Solid knowledge of fibre optic communications systems
- State-of-the-art fibre optics technology and installation practices
- Correct procedures for cable installation and termination
- How to design and install your own fully operational fibre optics system
- New approaches to troubleshooting including how to use an OTDR
- Know-how on interfacing fibre/wireless and Industrial Ethernet
- Ability to apply design rules for fibre/Wireless and Ethernet

WHO SHOULD ATTEND:

The workshop will benefit engineers and technicians involved in specifying, commissioning and maintaining industrial fibre optic systems, but who have little previous experience in this field, including:

- I & C Engineers and Technicians
- Telecommunications Engineers and Technicians
- Maintenance Engineers and Technicians
- Electrical Engineers and Electricians
- Project Engineers and Managers
- Process Control Engineers
- Consulting Engineers
- Systems Engineer

The Workshop

This comprehensive two-day workshop 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 workshop 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 provided to allow you to practice actual link design practicals using various parameters. Finally, you will have the opportunity to practice using various fibre optic test equipment such as optical sources and power meters. At the conclusion of the course you will gain know-how in interfacing, integrating and troubleshooting fibre with industrial wireless and Ethernet systems.

Practical Sessions

This is a practical, hands on workshop enabling you to work through practical exercises which reinforce the concepts discussed.

Practical sessions include:

- Fibre optic link design - a complete design of a fibre optic link
- Optical power measurement - the use of an
- Optical source and an optical power meter
- Continuity tester - the principles of operation of a simple fibre optic continuity tester
- Optical Time Domain Reflectometer (OTDR) - demonstration on the practical use of ODTR with a video presentation
- Optical connectors - gain experience in the techniques of fitting fibre optic connectors
- Use the patch cords constructed by participants to link 2 media converters to simulate (and test) a small backbone.

To gain full value from this workshop, please bring your laptop/notebook computer.

The Program

INTRODUCTION TO FIBRE OPTIC SYSTEMS
- Introduction and overview
- Background to fibre optics
- Fibre optics vs copper systems

DEFINITIONS AND BASIC PRINCIPLES
- Data communications and communications channels
- Transmission modes
- The electromagnetic spectrum
- Revisiting copper

THEORY OF FIBRE OPTIC TRANSMISSION
- Fundamental principles of operation
- Light transmission nature of glass
- Numerical aperture
- Modal propagation in fibres
- Multimode, single mode, step-index and graded index
- Bandwidth of fibres
- Modal and chromatic dispersion
- Absorption, scatter, bending, radiation and mismatches
- Other types of fibres

CONSTRUCTION OF FIBRE OPTIC CABLES
- Cable objectives
- Tensile ratings and structural elements
- Strengthening members
- Housings, sheaths and moisture barriers
- Classes of cables

CONNECTING FIBRES
- Optical connection issues
- Fibre end preparation
- Splicing fibres
- Connectors and optical couplers

OPTICAL DRIVERS AND DETECTORS
- Light emitting diodes and lasers
- Transmitter modules
- Safety considerations
- PIN photodiodes
- Receiver modules
- Optical amplifiers

INSTALLING FIBRE OPTIC CABLES
- Preparation, installation rules and procedures
- Bending radius, cable tension and cable reels
- Cable trays, conduits and lubricants
- Indoor cable installation and leaving extra cable
- Outdoor cable installation and environmental conditions
- Splicing trays, organisers, termination cabinets, breakout boxes, patch and distribution panels

FIBRE OPTIC SYSTEM DESIGN
- Initial design considerations
- Future capacity, reliability and operating wavelength
- Repeaters and amplifiers
- Design loss calculations and link loss budgets
- Design bandwidth calculations

TESTING OF FIBRE OPTIC SYSTEMS
- Concepts of optical measurement
- Continuity and insertion loss testing
- Optical Time Domain Reflectometry (OTDR)
- Bit Error Rate (BER) testing
- Eye diagrams and laboratory fibre tests

COPPER TO FIBRE
- Industrial Ethernet
- EMI/crosstalk/distance
- Where to switch out
- Interface devices - media converters/ gigabit interface converter modules/SFPs (Small Form Pluggable)
- Devices with multiple media connectors
- Multiplexers
- Design considerations
- Compromises

COPPER TO WIRELESS
- Industrial Wireless
- Wireless to fibre and copper
- Interface units

TROUBLESHOOTING FIBRE/ WIRELESS AND COPPER
- Hardware troubleshooting
- Ping/arp/wireshark/tracert

SUMMARY, OPEN FORUM AND CLOSING