Optical Transport Networks

COURSE DESCRIPTION:

This course firstly introduces the main principles of both Dense WDM and Coarse WDM, explaining the network evolution, spectrum allocation and channel spacing, equipment types, amplifiers, issues (such as dispersion and 4 wave mixing) and solutions and finishes by looking at network management & TMN.

We then look at OTN standards, network layers, frame structure, FEC, alarms, error handling, TCM maintenance signals and network management functions.

WHO SHOULD ATTEND:

Technicians, commissioning and maintenance engineers and anyone designing or working on WDM and OTN Networks.

PREREQUISITE TRAINING:

Basic knowledge of digital transmission and optical transmission plus SDH technology is beneficial but not essential

SOME COURSE BENEFITS:

- Identify key technologies in WDM systems
- Understand Equipment and optical interfaces in WDM systems
- Understand optical amplifiers and regenerators (1R to 3R)
- Identify the OTN layers and functions
- OTH multiplexing scheme
- Verify and test OTN (TCM and FEC)
- Be able to evaluate maintenance signals

COURSE OBJECTIVES:

- Understand Wavelength Division Multiplexing
- Be able to explain WDM network elements and inter-networking
- Describe the function of optical components used in WDM systems
- Understand OTN network principles
- Describe the multiplexing and mapping of the OTN signal
- Identify the different parts of the OTH frame
- Describe maintenance signals

FORMAT:

2-day, classroom theory, with quizzes and group exercises.
Maximum attendees 12 per course

CONTENT:
Day 1 – Wavelength Division Multiplexing

- The growth of bandwidth in the 21st century
- Introduction to multiplexing
- Time Division Multiplexing to Wavelength Division Multiplexing
- Optical Spectrum – C and L Bands
- Channel Spacing
- WDM Evolution
- Optical Network Elements (Amps, Regens, Mux's)
- Optical Modulation
- Optical Transponders and Amplifiers
- Transmission Parameters
- Penalties induced by optical fibre
- Attenuation
- Dispersion
- CD & PMD
- Non-linear effects
- Crosstalk, 4 wave mixing
- Types of Optical fibre (G.652, G.653, G.655)
- Power Budget Calculation
- 3 "R's" of Optical Networking
- WDM applications
- Network Management
- TMN

Day 2 – Optical Transport Networks

- Network Technology Trends
- OTN introduction
- OTN standards
- OTN network layers
- OTN advantages
- FEC (Forward Error Correction)
- OTN frame (ODU, OTU, OPU)
- Forward Error Correction (FEC)
- QOS & Q-factor
- TCM (Tandem Connection Monitoring)
- OTN Network Layers and Functions
- OTN Hierarchy
- Multiplexing and mapping OTUk, ODUk, OPUk Frame Structure
- Multiplex Structure
- ODU Rates
- OUT Mappings
- OTN Maintenance signals and alarms
- OTN Networking
- OTN Control Plane
- OTN planning tools
- NMS & EMS