

Certified Optical Network Engineer (CONE) Core Networks



On this Certified Optical Network Engineer training programme you'll learn how next generation optical networks can be engineered to use the power of light to meet the challenging demands of telecoms systems today. You'll learn about the clever things that can be done with light to deliver higher data rates over longer distances at lower cost than ever before. You'll also appreciate the supporting role played by recent advances in electronic communications technology in overcoming some of the impairments inherent in using existing infrastructure.



Duration:
5 days

Full Course Contents

INTRODUCTION

BECOMING A CERTIFIED OPTICAL NETWORK ENGINEER

- Optical networks
- Certification
- Standards
- Structure & assessment

CUSTOMER EXPECTATIONS & COMMS TRENDS

- The way we are now
- Customer expectations
- What are we communicating?
- Trends
- Challenges & solutions

UNDERSTANDING LIGHT

CHARACTERISTICS OF LIGHT

- What is light?
- Electromagnetic spectrum
- Wavelengths & frequencies
- Wave properties of light
- Interferometry
- Singlemode as a waveguide
- Speed of light
- Chromatic dispersion
- Polarisation mode dispersion
- Big and small

USING LIGHT TO TRANSFER INFORMATION

- Modulation
- Definitions
- Generating optical signals

- Detecting optical signals
- Modulation formats
- Multiplexing
- Wavelength range
- Problems with more channels

COMPONENTS

OPTICAL FIBRES

- Optical fibre structure
- How light travels along fibre
- Multimode & singlemode
- Operational parameters
- Singlemode vs multimode
- Optical fibres for telecoms
- Evolution of fibre standards
- Fibre manufacturing

PASSIVE OPTICAL COMPONENTS

- Splices & Connectors
- Attenuators: Fixed
- Passive power control devices
- Optical isolators
- Couplers & splitters
- WDM
- DWDM
- CWDM
- Circulators
- Filters
- Gratings
- Optical add-drop multiplexers

ACTIVE OPTICAL DEVICES

- Light sources
- Transceiver modules
- Receivers (detectors)
- Attenuators: Variable

- Dynamic channel equalisers
- Channel monitors

SYSTEM PERFORMANCE IMPAIRMENTS AND IMPROVEMENTS

SYSTEMS PERFORMANCE

- Satisfactory communications
- Measurements of signal quality

OPTICAL SIGNAL IMPAIRMENTS

- Impairments
- Degradation function

OPTICAL SIGNAL IMPROVEMENTS

- Power penalties
- Statistical vs deterministic performance
- Forward error correction
- Electronic dispersion compensation

MANAGING OPTICAL POWER LEVELS

POWER LEVELS IN BASIC OPTICAL SYSTEMS

- How long is long haul?
- Cabling losses
- Transmitting power levels
- Receiver power levels

CONTINUED OVERLEAF



OPTICAL POWER LEVELS IN NGONS

- Spectral attenuation
- Interface definitions
- Transmitting power levels
- Receiver performance
- Too much power in fibre

OPTICAL AMPLIFIERS

- Benefits & drawbacks
- Types
- How do they work?
- Components
- Operational characteristics
- Overcoming limitations
- Configurations
- Cost factors
- Amplifiers as broadband light sources
- Raman amplification
- Semiconductor optical amplifiers
- Planar optical waveguide amplifiers
- Standards
- Future developments

NON-LINEAR EFFECTS IN OPTICAL FIBRES

- Basics of optical non-linearities
- Scattering effects
- Kerr Effects

MANAGING DISPERSION

CHROMATIC DISPERSION

- What is it?
- What causes it
- Dispersion characteristics
- System dispersion factors
- Dispersion limited systems

CHROMATIC DISPERSION MANAGEMENT: OPTICAL

- Optical vs Electronic dispersion compensation
- Strategic issues
- Dispersion compensating fibres
- DCM performance examples
- Dispersion compensating gratings

- Dynamic dispersion compensation
- Dispersion accommodation

POLARISATION MODE DISPERSION

- Polarisation in fibres
- Polarisation in other system components
- PMD and system performance
- Second order PMD
- Dynamics of PMD

PMD MANAGEMENT: OPTICAL

- Strategic issues
- PMD compensators

OPTICAL NETWORKS

PHOTONIC NETWORKS

- Fibre optics communications links
- Photonic network technologies
- Multiplexing
- ADMs and OADMs
- ROADMs
- Switching
- Routing
- Optical (3R) Regeneration
- Digital optical networks

OPTICAL MODELLING SOFTWARE

- What can be modelled?
- System performance measurements
- Using the software
- Suppliers

PRACTICAL IMPLEMENTATION

IMPLEMENTING NEW NETWORKS

- Road based networks
- Railway lines
- Canal installations
- Power lines
- Pipelines
- Undersea



INSTALLATION ENVIRONMENTS AND METHODS

- Direct burial
- Ducted systems
- Overhead routes
- Powerline systems

UPGRADING EXISTING NETWORKS

- Preparation
- Fibre characterisation

MAINTENANCE

- Basics of network management
- Performance monitoring
- Security monitoring
- Routine preventative maintenance
- Emergency repair strategies

CASE STUDIES

ASSESSMENT & EXAMINATION

