OTT Certified Fiber Characterization Engineer (CFCE)

This five-day instructor-led course focuses on mastering the tests required to verify that an infrastructure can support high data rate (10+ Gb/s) applications, Raman amplification, and extended wavelength ranges for CWDM and DWDM systems, as well as those typically required to prove that the fiber will operate properly when dark fiber contracts are signed.

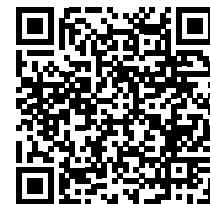**Audience:** OSP and network engineers, senior technicians, or designers

Prerequisite: Previous experience with fiber optics and knowledge of OTDR testing

Credentialing

OTT Certified Fiber Characterization Engineer

OTT Licensed and Delivered by
Fiber Insight

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Click or scan for detailed course information and upcoming training locations.

OTT Certified Optical Network Engineer (CONE)

Learn to meet the fast-evolving challenges of increasing capacity, reach, and flexibility, controlling latency, migrating to open/interoperable systems, and providing quality of service while keeping costs under control and reducing power consumption. Learn how the combination of coherent transmission and digital signal processing has transformed optical communications at the higher data rates of 100 to 800 Gb/s and about the changes necessary for DWDM systems to operate efficiently at data rates of 400 Gb/s and above.

Understand how a mix of optical and electronic technologies is used to overcome limitations, and the role of SDN and its implications for facilitating open line systems, ROADMs, and white box solutions. Appreciate the fundamental limitations that apply and the trade-offs and compromises necessary to make strategic decisions about the long-term plans for your network.

Audience: Anyone deploying advanced communication networks of 100 Gb/s and above. Typical roles include network designers, planners, network engineers and managers, and strategic network managers.

Prerequisite: OTT Certified Optical Network Associate (CONA) certification.

Credentialing

OTT Certified Optical Network Engineer

IEEE credits available for additional fee.

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Certified Fibre Characterisation Engineer (CFCE)

5 days

Purpose

As data rates increase and systems become more complex there are more factors that can impair system performance. This course is designed to help you master the fibre optic tests that are required to prove that advanced fibre infrastructures can support high data rate applications (10Gb/s, 40Gb/s, 100Gb/s) and Raman amplification as well as extended wavelength range operation for DWDM and CWCM systems. Typically it is necessary to characterise fibres when dark fibre contracts are signed, to prove that the fibres will operate satisfactorily for the duration of the contract period.

You will learn to apply the full power of multi-purpose test platforms with their powerful array of measurement capabilities to carry out these tests including bi-directional OTDR testing, chromatic dispersion, Polarisation Mode Dispersion (PMD) and spectral attenuation. You'll be able to process the results swiftly and efficiently, using test report software, to provide full system documentation. By appreciating the issues behind the tests you will be able to assess link performance intelligently against application support criteria.

Key outcomes

✓ explain the significance of fibre specifications including G.652.A, B, C & D, G.655.x, G.656 and G.657

✓ identify the characteristics of the infrastructure that can impair system performance

✓ design and plan test programmes to meet customer and operational requirements

✓ interpret test specifications

✓ describe the purpose of OTDR testing

✓ analyse OTDR traces and event tables

This is an advanced course and assumes that you have some previous experience of ILM and OTDR testing.

✓ explain what chromatic dispersion is and how it is measured

✓ describe PMD and explain how it can be measured

✓ perform full fibre characterisation on installed fibre systems

✓ interpret the results of fibre characterisation and map against application support criteria

Features

❑ hands-on experience using specially constructed test rigs

❑ comprehensive course manual

❑ electronic resources

❑ pass the assessment to gain Certified Fibre Characterisation Engineer (CFCE) status

If you would like your team to focus on how to carry out the tests efficiently, and how to verify that the acquired data is valid, then consider the task based, technician level CFCT course.

Certified Fibre Characterisation Engineer (CFCE)

BECOMING A CFCE
- What are optical networks?
- What is fibre characterisation?
- Why & when is it necessary?
- How is it done?
- Standards

CHARACTERISTICS OF LIGHT
- Electromagnetic spectrum
- Wavelengths & frequencies used in fibre optics
- Singlemode fibre as a waveguide
- Speed of light
- Dispersion

LIGHT IN OPTICAL FIBRES
- How fibres work
- Singlemode fibre
- Launch conditions
- Attenuation
- Dispersion
- Bend loss performance

OPTICAL FIBRES
- Optical fibres for telecoms
- Fibre standards

PREPARATION

PREPARING FOR FIBRE CHARACTERISATION
- Specification of parameters
- Fibre characterisation systems and resources checklists
- Management of test results
- Reference procedures

- Measurement procedures
- Using scripts

INSPECT+CLEAN CONNECTORS
- Why do we inspect & clean?
- Inspection standards
- Inspection equipment
- Cleaning equipment
- Connector care

ILM & SPECTRAL ATTENUATION
- Continuity checking
- Power & loss budgets
- Insertion loss measurements
- Spectral attenuation
- Live fibre identifiers

RETURN LOSS MEASUREMENT
- Definitions
- Performance requirements
- How is it measured?

OTDR TESTING

OTDR INTRODUCTION
- What is OTDR testing?
- What can it do for us?
- How does it work?

OTDR CAPABILITIES
- Distance measurements
- Fibre loss measurements
- Bending losses
- Splice loss measurement
- Connector losses
- Link return loss (ORL)

OTDR LIMITATIONS
- Dynamic range
- Dead zone
- Resolution

TEST CONFIGURATIONS
- Cable on a drum
- Installed cable before termination
- Connectorised systems

USING THE OTDR
- Step by step guide
- Manipulating the trace
- Measurement parameters

OTDR ISSUES
- Poor launch conditions
- Interfacing with bare fibres
- Ghosts
- Fibre mismatches

OTDR TRACE ANALYSIS
- What info do we want?
- Analysis of a single trace
- Multiple wavelength traces
- Analysis of multiple fibres
- Bi-directional analysis
- OTDR trace comparison

USING OTDR SOFTWARE
- OTDR viewer software
- Automatic event detection
- Comparing OTDR traces

DISPERSION

INTRO TO DISPERSION
- When do we need dispersion measurements?

CHROMATIC DISPERSION
- What is it?
- What causes it?
- CD characteristics of common fibre types

CD MEASUREMENT METHODS
- Standards
- Group delay and dispersion
- Time of flight techniques
- Phase Shift Techniques

PRACTICAL EXERCISES
- G.652 & G.655 systems
- DCMs
- Compensated links
- Amplified links

POLARISATION MODE DISPERSION
- Polarisation in fibres
- Polarisation in other system components
- PMD & system performance
- Second order PMD
- Dynamics of PMD

MEASUREMENT TECHNIQUES
- Interferometric technique
- Polarimetric technique
- Fixed analyser technique
- Wavelength scanning
- Interpreting test results

PMD MEASUREMENT ISSUES
- What are we testing & why?
- Factors affecting choice of technique

PMD MEASUREMENT EXERCISES
- Low PMD fibre link
- High PMD fibre link
- Concatenated links
- Amplified links

REPORTING
- Measurement validation checklist
- OTDR measurement presentation
- Fibre characterisation reports
- Web based documentation

LINK ACCEPTANCE CRITERIA
- Fibre distances
- Cabling losses
- Reflections
- Chromatic dispersion
- PMD
- Extended wavelength requirements
- Support for Raman amplifiers

CFCE ASSESSMENT
- Case study assignment
- Theory assessment