BLACKBIRD FOR TRAINING

Telecommunications and Fibre Optic Networks Course

22 – 26 February 2027
Barcelona (Spain)

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Introduction:

Telecommunications and fibre optic networks are systems that carry voice, data and video as pulses of light through optical fibre, across long-haul transport routes and access links that reach homes, businesses and mobile sites. This 1-week course is for engineers and technicians who plan, build, test and maintain fibre networks, and its final deliverable is a fibre link design and acceptance test pack. It is taught at an intermediate to advanced, practitioner level through case studies on route surveys, link budgets and OTDR optical time-domain reflectometer traces, referring to ITU-T Recommendations, the international standards for fibre and transmission.

Course Objectives:

- Distinguish single-mode from multimode fibre and ITU-T G.652 from G.657 categories, and select the fibre type that suits each network segment
- Compare SDH with OTN transport and DWDM with CWDM systems, and select the transmission approach that fits capacity, reach and cost
- Apply fusion splicing, connector end-face inspection and light source and power meter testing to install and accept fibre links to standard
- Interpret OTDR traces to locate breaks, macrobends, high-loss splices and reflective events, and justify the repair each one needs
- Apply optical link budget calculations that combine fibre attenuation, splice and connector losses, dispersion and system margin
- Justify GPON or XGS-PON access designs, splitter ratios, route protection and maintenance choices for FTTx and mobile transport

Target Audience:

- Transmission engineers who configure and run optical transport links, deciding which DWDM, CWDM or OTN approach suits each route
- Access network engineers responsible for FTTx and PON roll-out, choosing splitter architectures and capacity upgrade paths
- Fibre network technicians who splice, terminate and test cables, judging whether a link meets its acceptance loss
- Network planners who lay out routes and fibre counts, deciding fibre types, spare capacity and route diversity
- Field and maintenance staff who respond to outages, judging where a fault sits on an OTDR trace and how to repair it
- Telecom project engineers who oversee contractors and handover, deciding whether installation records and test results are complete

Course Outline:

Day 1: Optical Fibre Foundations: Light Propagation, Fibre Types and Loss Mechanisms

- Total Internal Reflection and Numerical Aperture: How Light Is Guided in Fibre
- Single-Mode vs Multimode Fibre: Core Sizes, Reach and Typical Network Uses
- ITU-T G.652 and G.657 Fibres: Standard and Bend-Insensitive Single-Mode Categories
- Attenuation Mechanisms: Absorption, Rayleigh Scattering and Bending Losses Across Wavelength Windows
- Chromatic and Polarisation Mode Dispersion: Pulse Spreading Limits on Bit Rate

Day 2: Transmission Architecture: SDH, OTN and Wavelength Division Multiplexing

- SDH vs OTN Framing: Legacy Synchronous Transport and ITU-T G.709 Digital Wrappers
- DWDM vs CWDM Systems: ITU-T G.694.1 and G.694.2 Wavelength Grids Compared
- Optical Amplifiers and ROADMs: EDFA Gain, Noise and Reconfigurable Wavelength Routing
- Transceivers and Pluggable Optics: SFP, QSFP and Coherent Modules in Transport Links
- Fibre in Mobile Fronthaul and Backhaul: Transport Choices for Radio Access Sites

Day 3: Core Field Skills: Splicing, Connectors, Testing and Link Budgets

- Fusion vs Mechanical Splicing: Cleave Quality, Splice Loss and Field Use
- Connector Types and End-Face Inspection: LC, SC, APC and UPC Polishes
- OTDR Trace Interpretation: Events, Dead Zones, Ghosts and Bidirectional Averaging
- Light Source and Power Meter Testing: IEC 61280 Insertion Loss Methods
- Optical Link Budget Calculation: Transmitter Power, Receiver Sensitivity and System Margin

Day 4: Access Networks, Installation Risks and Fault Troubleshooting

- GPON vs XGS-PON: ITU-T G.984 and G.9807 Access Capacity and Coexistence
- FTTx Network Design: Splitter Ratios, Splitting Levels, Feeder and Drop Cabling
- Installation Practice to TIA-568 and IEC 61300: Bend Radius, Cleanliness and Records
- OTDR Fault Location: Breaks, Macrobends, High-Loss Splices and Reflective Connector Events
- Preventive Maintenance and Network Resilience: Ring Protection, Route Diversity and Fibre Monitoring

Day 5: Case Study: Designing and Validating a Fibre Network Link Plan

- Case Route Survey Review: Applying Fibre Selection and Attenuation Analysis to Spans
- Case Transport and Access Design: Applying DWDM Channel and GPON Splitter Plans
- Case Link Budget Build: Applying Loss, Dispersion and Margin Figures End to End
- Measured vs Designed Loss: Diagnosing Case OTDR Traces and Defending Repair Decisions
- Fibre Link Design and Acceptance Test Pack: Final Assembly, Records and Handover

Skills You Will Gain:

- Optical Fibre Selection
- Attenuation and Dispersion Analysis
- Fusion Splicing
- OTDR Trace Analysis
- Optical Link Budgeting
- DWDM Channel Planning
- PON Splitter Design
- Fibre Fault Location

Why Attend This Course:

- From relying on an instrument's automatic event table to interpreting each OTDR event and confirming fault positions independently
- From quoting link lengths alone to building link budgets that combine loss, dispersion and margin before equipment is ordered
- From treating SDH, OTN, DWDM and PON as separate silos to seeing how transport and access layers connect end to end
- From scattered test sheets and route drawings to a fibre link design and acceptance test pack that others can review and repeat

Conclusion:

Fibre telecommunications rest on one principle: light carried through glass loses power and spreads over distance, and every design choice, splice and test exists to keep that loss and spreading within what the receiver can handle. The course makes three distinctions clear: single-mode versus multimode fibre, SDH and OTN transport versus DWDM wavelength capacity, and GPON versus XGS-PON access. It suits engineers and technicians who already work on telecom networks and now need intermediate to advanced skill in testing, link budgets, transmission design and fault location.

Frequently Asked Questions FAQ:

What do delegates need before a telecommunications and fibre optic networks course?

Delegates need working experience of telecom networks or fibre installation, a basic grasp of decibels and optical power, and familiarity with network diagrams. Hands-on OTDR experience helps but is not required, as trace reading is built up step by step across the course.

How does a telecommunications and fibre optic networks course differ from a basic fibre installation course?

It goes beyond cable handling. Installation courses focus on termination and splicing practice, while this course adds transmission systems, DWDM and OTN, PON access design, link budget calculation and OTDR fault diagnosis for engineers and technicians who already know the basics.

Why does OTDR testing matter in telecommunications and fibre optic networks?

An OTDR shows where loss occurs along a fibre, not only how much. It measures backscattered light to locate splices, connectors, bends and breaks by distance, which lets field teams find faults quickly and confirm that new installations match their design.

What do delegates take back to work from telecommunications and fibre optic networks training?

Delegates take back a fibre link design and acceptance test pack: a fibre selection rationale, transport and access design notes, a link budget worksheet, annotated OTDR trace findings and a handover record that teams can reuse on their own routes.