Systems & Network Training

# Essential optical transmission

A 2 day training course

Save on expenses. This course is also available on your premises.

## Description

Transmission is the process of sending information along a medium of, copper, fibre or wireless. This course looks at transmission techniques for fibre networks. The course aims to demystify the technologies involved by explaining all the buzzwords used in optical transmission.

## Key outcomes

By the end of the course delegates will be able to:

- ✔ Describe various optical transmission technologies.
- ✔ Explain how SDH and OTN work.
- ✔ Explain how WDM, CWDM and DWDM work.
- ✔ Explain PON, GPON and GEPON.

## Training approach

This structured course uses Instructor Led Training to provide the best possible learning experience. Small class sizes ensure students benefit from our engaging and interactive style of teaching with delegates encouraged to ask questions throughout the course. Quizzes follow each major section allowing checking of learning.

## Details

**Who will benefit?**
Anyone working in telecommunications.

**Prerequisites**
None.

**Duration:** 2 days

**Customer rating:** **New course**

| Generic training | Small class sizes | Hands On training | Our courseware | Customise your course |
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| Generic training complements product specific courses covering the complete picture of all relevant devices including the protocols “on the wire”. | We limit our maximum class size to 8 delegates; often we have less than this. This ensures optimal interactivity between delegates and instructor. | The majority of our courses use hands on sessions to reinforce the theory. | We write our own courses; courseware does not just consist of slides and our slides are diagrams not bullet point text. | Please contact us if you would like a course to be customised to meet your specific requirements. Have the course your way. |
| “*Friendly environment with expert teaching that teaches the why before the how.”* G.C. Fasthosts | *“Excellent course. The small class size was a great benefit...”* M.B. IBM | *“Not many courses have practice added to it. Normally just the theoretical stuff is covered.”* J.W. Vodafone | *“Comprehensive materials that made the course easy to follow and will be used as a reference point.”* V.B. Rockwell Collins | *“I was very impressed by the combination of practical and theory. Very informative. Friendly approachable environment, lots of hands on.”* S.R. Qinetiq |

# Essential optical transmission

## Course content

**Transmission basics**

Systems, media, signals. Signal degradation, noise, distortion, attenuation. Digital, analogue. Modulation, encoding.

**Fibre transmission**

Fibre vs copper, optical transmission, fibre characteristics, fibre component parts. Multi Mode Fibre (MMF). Single Mode Fibre (SMF). Fibre connections. Lasers. Attenuations, dispersion, optical signal noise ratios (OSNR) and their effects. Channel Spacing and Signal Direction. Limiting factors to single wavelength.

**SDH**

Timing and synchronisation of digital signals, the plesiochronous digital hierarchy (PDH), the synchronous digital hierarchy (SDH), service protection with SDH. TDM. Standards, basic units, frames, STM1 frame, bit rates, STM0, STM1, STM4, STM16, STM64, STM256, SDH architecture, rings, Add drop multiplexors. SDH network topologies, structure of SDH equipment, SDH synchronisation, protection switching in SDH networks, SDH alarm structure, testing of SDH, equipment and systems, Ethernet over SDH.

**OTN**

G.709, OTN interface structure, Optical transport modules, ONNI, OCh, OUT, ODU, OPU. G.709 amendments.

**WDM overview**

Multiplexing, TDM, WDM benefits. WDM standards. CWDM vs. DWDM. Four Wave Mixing (FWM). Impact and countermeasures to FWM on WDM.

**DWDM**

ITU G.694.1, channel and spacing. Optical Terminal Multiplexers (OTM). Optical Add/Drop Multiplexers (OADM). Adding versus dropping. Optical Amplifiers. Erbium Doped Fibre Amplifiers (EDFA). Transponders and Combiners. Optical and Electrical Cross Connects (OXCs/DXCs). Cross Connect types (Transparent/Opaque). Advantages and disadvantages of various Optical cross connects.

**FTTx**

Fibre installation and air blown fibre, FTTH, FTTC, FTTN, FTTD, FFTH topologies and wavelengths, active or passive optical network.

**PON variants**

Gigabit passive optical network (GPON), Gigabit Ethernet passive optical network (GEPON), Time division PON (TDM-PON), XG-PON, Wave Division Multiplexing PON (WDM-PON), 1Gbps, 10Gbps, 40Ggps, 100Gbps FSAN (Full Service Access Network) NGA (Next Generation Access), Strategies for TDM-PON to WDM-PON migration, Architecture of NG-PON (hybrid WDM/TDM PON), Additional services than triple play.