Gigabit Passive Optical Networking (XGPON-GPON)

<table>
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<tr>
<th>Course Code</th>
<th>PWL039</th>
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<tr>
<td>Duration</td>
<td>5 Day Course</td>
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<tr>
<td>Price</td>
<td>$3,835</td>
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Course Description

This course is designed to benefit those requiring an in depth knowledge of the principles and applications of Ten Gigabit and Gigabit Passive Optical Networking and Fibre Systems such as Fibre to the X (FTTx) applications and their associated equipment, its flexibility and function within a modern transmission network.

Using an effective mix of “hands on” equipment instruction and correlation to theory based learning the delegate will gain a complete understanding of the equipment and the tasks to be undertaken in a real life situation.

Objectives

- Advantages of PON/FTTx Systems
- The Variants of the systems
- Network Elements and designs
- Supported Applications and Network Interfaces
- Synchronisation methods in PON Network
- Circuit Provisioning and Bandwidth requirements
- Upstream & Downstream Issues
- Headend & Network Elements/OLT-ONT
- The need for an effective Network Management System
- Capacity Planning workshop
- Network Testing with OTDR test sets

Course Modules

Definitions FTTN, FTTC, FTTH (17 topics)

- Fiber to the Home (FTTH)
- FTTC (Fiber to the Curb)
- FTTN (Fiber to the Node)
- FTTD (Fiber to the Desk)
- FTTH market
- Single Mode Fiber (SMF)
- Multimode Fiber (MMF)
- Passive Optical Network (PON)
- Gigabit Passive Optical Network (GPON)
- Gigabit Ethernet Passive Optical Netowrk
- Time Division PON (TDM-PON)
- Wave Division Multiplexing PON (WDM-PON)
- 1Gbps, 10G, 40G, 100G
- Optical Splitters 1x8, 1x16, 1x32, 1x64, 2x64
- SAN (Full service Access Network) NGA (Next Generation Access)
- AWG (Arrayed Waveguide Grating) Splitters
- Strategies for TDM-PON to WDM-PON Migration
GPON OSP Design (9 topics)
- GPON OSP Centralized Design
- GPON OSP Distributed Design
- GPON OSP F1 Fiber Deployment
- GPON OSP F2 Fiber Deployment
- GPON PON Splitters x4 x8 x32
- Fiber Connectors SC, LC, FC, APC
- Fiber Splice Trays
- Fiber Cassette Trays
- Fiber Enclosures

GPON Fiber Termination (7 topics)
- GPON field testing
- GPON field installation verification
- GPON Physical Layer Testing
- Optical Time Domain Reflectometer OTDR
- Optical Power Source
- Optical Power Meter
- Optical Return Loss (ORL)

GPON ITU-T G.984.1 GPON General Characteristics (6 topics)
- Reference Model / Terminology / Architecture
- Access Network System Management Functions
- Example of ONT functional blocks
- Example of OLT functional blocks
- FTTx Scenarios
- The four switching arrangements for external access network backup

GPON ITU-T G.984.2 Physical Media Dependent (PMD) (4 topics)
- Physical Layer
- Enhancement Band
- Bit Rate and wavelengths
- FEC and RAMAN

GPON ITU-T G.984.3 Transmission Convergence (12 topics)
- Frame Structure
- GPON Encapsulation Method (GEM)
- GTC adaptation sublayer / GTC framing sublayer protocol stack
- Status reporting DBA (SR-DBA) & Traffic-monitoring DBA (TM-DBA)
- Transmission container (T-CONT) types
- Downstream multiplexing / Upstream multiplexing
- GEM port identifier / Alloc-ID
- Media access control and ONU registration
- Scheduling architecture for extended bandwidth assignment model
- PLOAM Messages / Alarm Messages
- Downstream FEC and Upstream FEC
- Order of processes in a GTC transmit flow

GPON ITU-T G.984.4 and G.988 ONT Management and Control Interface (OMCI) (3 topics)
- Management Interface
- Reference model
- Typical ONT with SCTE 55-1 or SCTE 55-2 compliance
GPON ITU-T G.984.5 Enhancement Band (3 topics)
- Band Options
- GPON NGA
- Wavelength allocation

GPON ITU-T G.984.6 Optical Reach Extension (G.984.re) (5 topics)
- Reach Extension (RE)
- OA-based reach extenders
- OEO-based reach extenders
- Protection
- Reach extender with OTDR blocking filters (BF) and bypass (BYP) filters

XG-PON ITU-T G.987.1 - 10 Gigabit Passive Optical Network XG-PON (6 topics)
- XG-PON scenarios
- Reference Access Network Architecture
- XG-PON with G-PON through WDM1r / WDM1r Example
- G-PON and XG-PON Wavelength allocation
- Co-existence of G-PON and XG-PON with video overlay option
- RE migration scenarios

XG-PON2 G.989 40Gbps (3 topics)
- Functional reference architecture
- NG-PON2 system coexistence with legacy systems
- Definitions of legacy compatibility terminology

GPON Components (3 topics)
- GPON OLT
- GPON ONT
- GPON Encapsulation Method (GEM)

GPON Management (3 topics)
- Operational Support Systems (OSS)
- Network Management Systems (NMS)
- OMCI (ONT Management Control Interface)

GPON RG (Residential Gateway) (3 topics)
- Allocate resources between diverse processing requirements
- Provide dynamic multifunctionality
- Simultaneous functionality for voice, video, and data, resulting in broadband service guarantees

Home Networking (10 topics)
- GPON Home Cabling
- GPON Broadband-Forum Standards
- Broadband-Forum TR-069
- HPNA (HomePhone Network Alliance)
- PowerLine Carrier (PLC)
- GPON DLNI
- G.hn
FSAN GPON Interoperability (2 topics)
- Full Service Access Network (FSAN)
- ITU-T OMCI Implementers’ guide

FTTH Council (3 topics)
- FTTH Council Certification
- Standard for Network Certification
- Quality for Use of The Fiber-Connected Home Badge

Vendor Implementations (10 topics)
- Alcatel-Lucent
- Ericsson
- ECI
- Adtran
- Occam
- Calix
- Motorola
- Scientific Atlanta/Cisco
- Tellabs
- Hitachi

Comparison of APON, BPON, GPON, GEPON (1 topic)
- IEEE 802.3ah standard Ethernet in the First Mile (EFM)

IETF Related Standards (1 topic)
- IETF RFC4562 "MAC-Forced Forwarding: A Method for Subscriber Separation on an Ethernet Access Network"

GPON Clock Sync (2 topics)
- GPON Frame Synchronization to Network Timing
- Direct Clock Synchronization Interface (BITS)

Multiservice Access Platform (MSAP) (6 topics)
- GPON
- VDSL2
- ADSL2plus
- Wireless
- WiMAX
- WLL

Appendix of Term (1 topic)
- Fibre Terminology

PON Designing & Planning (5 topics)
- Link Budget, Reach & Split Ratio
What Our Customers Say

“The training was delivered with a high level of expertise and excellence. Instructor was highly knowledgeable.”

— Technical Trainer, Aviat Networks

PON Services (3 topics)

- VOIP & TDM based Voice Services
- VLANS
- Video Services

Various kinds of Fibre & Technology Used For FTTH (3 topics)

- Bend insensitive Fibre G652D,
- G655 Standard for CWDM & DWDM Networks
- Micro Cables & Blown Fibre

Hands on Practical Assignments (9 topics)

- Single and Multimode Fibre recognition
- Fibre Cleaning methods
- Checking cleaning with an Optical Microscope
- Optical Light Source and Optical Power Meter referencing
- PON Splitter and Fibre drum testing with an Optical Power Meter
- 6km Classroom Passive Optical Network testing with an OTDR at 1310/1550nm
- Using decibels (dB's) and decibel milliwats (dBm's)
- Designing networks up to 20km long using vendor specifications (Power Budget)
- Fault Finding with a visible fault locator

Prerequisites

None, however the course assumes that delegates have some previous exposure to the technology.

Course Dates

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<th>Location</th>
<th>Duration</th>
<th>Price</th>
<th>Nov</th>
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<th>Jan</th>
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<td>PWL039</td>
<td>London</td>
<td>5 Days</td>
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“Overall the course was really good, the trainer really understood the material and was very approachable.”

— **Customer Training Manager**, Aviat Networks

“Excellent course, informative and well-paced.”

— **CSE**, Cisco

**CISCO**

“Course was very well outlined. Topics were great and bridged many gaps.”

— **System Engineer**, Cable & Wireless

“An excellent intro to video encoding & MPEG transport streams - I would definitely recommend it.”

— **Broadcast Engineer**, Cisco

**CISCO**

“Definitely an excellent intro. Left me interested in learning more.”

— **Broadcast Engineer**, Eircom

“Excellent training course with real examples and practical classroom demonstrations.”

— **Transport Designer**, Orange
“Instructor knowledge and experience was excellent.”
— Solutions Engineer, Akamai

“Excellent course, very clear and well organised. Course content delivery was very good.”
— Assistant Engineer, Dhiraagu

“Very informative and appropriate.”
— Network Support Technician, BT