Optical Networking

Course No. 2002 **Duration:** 2 Days

Course Overview:
This seminar will present WDM Networks, their building blocks and design concepts, aspects of control and management and survivability. A short overview on Optical Access Networks will conclude the seminar. This seminar will complement the "hardware" description of the Optical Communication.

Who should attend?
- This seminar is addressed to Telecom Engineers, wishing to get a full understanding of the potential of the emerging Optical Networks. This seminar assumes a basic understanding of Communication Protocols (such as given in the Intro to Modern Data Communications seminar).

Prerequisite
- Previous participation in the Optical Communication – Technology and Potential seminar is recommended but not mandatory.

Course Content:

1. Introduction

2. Optical fiber
- Light wave principles
- Wavelength, Loss, Reflection and refraction
- Fiber Types (S.M and M.M) and characteristics
- Ribbon Fibers
- Dispersion and Non-linear effects
- Non-silica fibers and fibreless optics
- Specifications and data pages
  - MM – Step and Graded index
  - SM – SMF-28/G.652, DSF and NZDSF fibers

3. Optical Network components
- Optical Cables (indoors, outdoors, Ribbons) Fiber connections
  - Connectors (types and applications)
  - Splices

4. Measurements
- End-to-end Loss budget measurement and calculation,
- Test equipment (OTDR, Power Meter...)
- Acceptance tests and validation

5. Security in Optical networks
- Principle, Tapping, Clip-on device
- Intrusive tapping on optical Networks and detection
- RFTS – Network Monitoring

6. Optical Components
- Couplers
- WDM, CWDM and DWDM
- Isolators and circulators
- Diffraction gratings
- Multiplexers and filters (Fiber bragg gratings, Fabry-Perot, Thin-films, Mach-Zehnder, Arrayed waveguide and Acousto-optic tunable filters)
- Dispersion Compensators
- LEDs, LDs transmitters and Detectors
- Erbium Doped-fiber amplifiers (EDFA)
- Modulators

7. Optical Switching
- Types, principles and applications
- Optical Switching components
  - Types, principles and characteristics
  - MEMS, Liquid-crystal , Inkjet bubble, Electro/thermo/acoustic-optical and others
- Optical switching subsystems and engineering
- Networking and trends

8. WDM Technologies
- DWDM and CWDM
- Principle, wavelength and operation
- Wavelength planning
- Uni and Bi-directional
- Optical Add/drop multiplexer
- Applications, advantages and disadvantages
- Provisioning, Control and management

9. Introduction to Optical Networks
- End-to-end Network architecture
- Customer side, access, metro and core
- First, Second and Third generation networks
- Optical layer
- Network layers (IP/Ethernet over MPLS over SDH or Optic layers)
- Network survivability and protection

10. Market Strategy, Companies and Activities
- Explanation of different Network Strategies and targets
- Example of some Operator's optical networks

11. Summary

12. Bibliography

13. Glossary