Course ID	Course Title
OPTNET	**Optical Networking for Professionals, Managers, and Executives**
Course Duration	
2-3 days	

Related Courses

- SONET/SDH: Principles and Design (SONET-SDH, 2 days)
- DWDM: An Introductory Tutorial (DWDM101, 2 days)
- DWDM Principles and Design: An Advanced Tutorial   (DWDM, 2-3 days)

Aimed At

This course is aimed at managers/executives, business strategists/planners, marketing/sales personnel, and others in telecommunications, IT, planning, or procurement organizations who need to understand optical networking from a less technical and more business vantage point. It can also serve as an introduction for those who need to undertake network engineering.

Group Size

5-25

Prerequisites

Those wishing to take this course should have a basic knowledge of packet-based networks and general high-school level science and math.

Course in a Nutshell

This course covers optical networking from soup to nuts for non-engineers. It is designed to introduce optical networking to persons who wish to learn about the subject for management, planning, marketing/sales, or procurement purposes but who do not have an advanced technical or mathematical background. It includes the basic material of fiber optic components, systems, and networks. It provides an introduction to the operating principles of optoelectronic devices used in various current and future information processing and transmission systems, and to the principles of optical fiber operation. It also discusses the operation of optical networks and optical network technology such as SONET, and how to buy optical networking services.

This course deals with all of the key issues of understanding, designing, and implementing optical networks. We will begin with a quick review of basic physics relevant to optical networks and devices. We will then study the construction of optical fiber, the light sources used (lasers and LEDs), detectors, and other optical networking devices. We next cover testing and deployment of fiber, and then move on to wave division multiplexing (WDM) and opto-electronic networks such as SONET. We discuss design of optical networks, the economic and business aspects of optical networks, and how to buy optical networking services. Examples are shown throughout, and short exercises are provided.

Customize It!   Let us know your reason for studying optical networking so we can customize the course to your specific needs. If you do not possess prior knowledge of IP or basic communications network technology, the course can be expanded to four days to cover these topics.

Learn How To
- Understand the physical principles of optical devices and networks
- Understand operation of fiber optic components
- Make components work together to create useful fiber optic networks
- Use optical components to create large-scale communications networks
- Buy optical communications services and what they cost
- Understand functioning of all-optical networks, and their advantages and problems
- Grasp basic economics of fiber-based networks

Course Outline
- Introduction to optical networks and communications
  - Overview of fiber optical communications systems
  - Fundamental drivers behind use of light as a communications medium
  - History of optical network technology. Digital representation of signals
  - OSI protocol stack
  - Basic physics review

- Physical principles of optical fiber
  - Basic principles of optics as applied to fiber optic devices
  - Summary of relevant background from physics
  - Total internal reflection
  - Diffraction and interference
  - Types of optical fiber and devices and principles of their operation
  - Dispersion

- Lasers
  - Photons and matter
  - Conductors, semiconductors, and insulators
  - Resonators
  - Population inversion
  - Laser operation
  - Laser characteristics

- LEDs and Semiconductor Lasers
  - Doping of semiconductors
  - Band gaps
  - LED operation
  - Semiconductor lasers
  - Light coupling to/from fibers
  - Limitations of semiconductor light sources

- o How to choose the best light source

- Semiconductor light detectors
  - o Types of detectors
  - o Operation of detectors
  - o Photodiodes and phototransistors
  - o Avalanche photodiodes
  - o Noise sources
  - o Signal-to-noise considerations

- Optical amplifiers
  - o Basic principles of optical amplifiers
  - o EDFAs
  - o Semiconductor optical amplifiers

- Other optical networking devices
  - o Couplers
  - o Splitters
  - o Isolators
  - o GRINs
  - o Fabry-Perot and dielectric filters
  - o Gratings
  - o FBGs
  - o AWGs
  - o Modulators
  - o Switches
  - o Interferometers

- Modulation methods
  - o OOK
  - o Multi-state coding
  - o AM
  - o FSK
  - o PSK
  - o PokSK

- Optical fiber fabrication
  - o Purification
  - o Doping
  - o OVD process
  - o Structure of practical fibers
  - o Cabling environments
  - o Dangers to optical fiber
  - o Joining optical fibers
  - o Fiber optic connectors

- Fiber optic testing
  - o General principles
  - o Power meters

- o Optical spectrum analyzer
- o Optical time domain reflectometer
- o Bandwidth testers

- Opto-electronic networks
  - o FDDI
  - o Fiber channel

- SONET and SDH
  - o Overview
  - o Advantages
  - o Basic structure
  - o Frame generation
  - o Frame structure
  - o SONET/SDH hierarchy
  - o Overhead
  - o Alarms
  - o Tributaries and virtual tributaries
  - o Pointers
  - o SONET network configurations

- Ethernet over optical networks
  - o Brief review of Ethernet
  - o Ethernet operation
  - o CSMA/CD
  - o Implementation (earlier)
  - o Implementation (in optical networks)
  - o Ethernet over SONET

- Wave Division Multiplexing
  - o Why do it
  - o Types
  - o DWDM overview
  - o DWDM capacity
  - o DWDM components
  - o DWDM architecture
  - o ITU standards
  - o Physical limitations
  - o Typical problems in DWDM networks
  - o OEO and all-optical switching

- Noise and detection
  - o Types of noise and distortion which affects optical signals
  - o Methods of reducing effects of noise and distortion
  - o Optimal detection methods and devices.

- Optical system design
  - o How fiber optic systems differ from conventional systems
  - o Assembly of a communications network from fiber optic

components
- o Calculation of loss and dispersion
- o Carrier network architectures

- Data transmission technologies
  - o Packet over SONET/SDH (POS)
  - o Dynamic Packet Transport (DPT)
  - o MPLS

- How optical networking services are marketed and sold
  - o What you can buy
  - o How to determine what you need
  - o Pricing in today's world
  - o Pricing tools

- Optical networking in the real world
  - o Business aspects of optical networking
  - o Interaction among technology, finance, human factors
  - o Why better technology doesn't always sell in the marketplace

- Future directions in all-optical networks
  - o Free-space optical networks
  - o Scaling limitations of optical networks
  - o Technology directions and impact on design and deployment of optical networks

- Wrap-up: Course Recap, Discussion, Evaluation

How You Will Learn

- A seasoned instructor, well versed in a range of telecommunications technologies, will present this course in interactive lecture format.
- Along with the lecture, we will use examples, discussion, and exercises to enrich the instruction and drive home the essential points.
- If you already know something about the optical networking technology, we will build on that knowledge. We'll compare and contrast what's familiar with what's new, making the new ideas easier to learn as well as more relevant.
- We will use meaningful and ingenious examples and analogies to simplify the technical subject matter.
- You will receive a printed Participant Handbook which will help you remember and retain what you learned in class and apply it on your job.

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