

WIMAX 3G & 4G



3G (Data & Voice), 4G (Wimax & LTE)

The course's curriculum is suitable to professionals new to WiMAX, 3G & 4G communications and those needing an update on the latest 3G & 4G technologies, products, networks, services, standards, and trends. While the course covers all of WiMAX, 3G & 4G technologies, it is not an engineering course. We simplify complex technologies so you won't need an engineering degree to understand them.

Course Objectives

At the end of this course, delegates will:

- Understand the details of telecom networks and technologies
- Understanding WiMAX Wireless
- 3G & 4G Radio Signaling Fundamentals
- 3G system, WiMAX Network Planning , Design & Optimization
- New Alternative 3G & 4G Voice and Data Networks
- 3G & 4G Network Technologies, Architectures, Generations & Standards
- 3G & 4G Applications & Services
- Examining The Future of 3G & 4G Communications

Who Should Attend

This course is designed to provide a technical overview for technical sales and marketing managers, data communications professionals, software engineers, network design and information systems engineers.

Prerequisite

Attendees should have existing experience on following modules:

1. Basic Radio Concept
2. A good understanding of mobile wireless network basics and concepts

Understanding IP and Data networking

Course Duration

36 Hours, 12 Classes, 3 Hours per class

Course Details

Lesson 01: High Speed Wireless Data: Standards and proprietary solutions

- Telecommunications networks
- WiMAX Markets
- Fixed, Nomadic and Mobile Users
- Standards based solutions
- Proprietary solutions
- 802.11 IEEE standards
- 802.16 IEEE standards
- 10-66 GHz Technical standards
- 2-11 GHz standards
- Overview of 802.20 standard

Lesson 02: Radio Fundamental Overview

- What are radio waves?
- The Electromagnetic Spectrum
- Controlling radio use, the role of the regulator
- Radio bandwidth and channels
- Signal to Noise Ratio
- The Cornerstone of All Data Communications: Shannon's Law
- The Thermal Noise all Around Us
- Man-made Noise
- Impact of Rainfall
- Decibels, dBm, dBw and dBi
- Antennas: dipole and isotropic and antenna gain.
- The job of Radio Modulation
- Modulation Techniques
- Forward Error Correction
- Multipath and Fading

Lesson 03: Basic Radio & RF concepts

- RF generation & transmission
- Oscillators
- Power amplifiers
- Antennas & feedlines
- RF reception
- Modulation of RF signals
- Amplitude modulation
- Frequency modulation
- Complex modulation
- Duplexing
- FDD
- TDD
- Multiple access techniques
- Spread-spectrum modulation
- OFDM
- Ultra Wideband

Course Details

Lesson 04: WiMAX physical layer

- TDD & FDD
- OFDM, OFDMA and SOFDMA
- WiMAX Radio Bandwidths and Frequencies
- Modulation and FEC
- WiMAX and MIMO Antennas

Lesson 05: The medium access control (MAC) layer

- The MAC & WiMAX architecture
- Service classes & QoS
- Service specific convergence sublayers
- Transmission convergence (TC) layer

Lesson 06: How WiMAX works

- Channel acquisition
- Initial ranging & negotiation
- SS authentication & registration
- IP connectivity
- Radio link control (RLC)
- The UL
- Service flow

Lesson 07: Propagation, Path Loss, Fading & Link Budget

- Path Loss & System Coverage
- Fading
- Empirical and Physical Modeling
- Line of Sight Propagation Model
- Power Law Model

Lesson 08: System implementation, testing and optimization

- Real world design examples
- Local coffee house
- Office LAN deployment
- 2.4GHz RF coverage results
- 5.6GHz RF coverage results
- Capacity requirements
- System design analysis
- Community WISP
- A Garden style apartment complex
- RF considerations
- Backhaul
- Weatherproofing
- Grounding & lightning protection

Course Details

- A small area subdivision
- Equipment selection
- Spectrum issues
- An urban or suburban area serving business users
- Design considerations
- A small town system for consumer & business users
- Mobile broadband network
- Initial modeling
- Preliminary information
- Coverage modeling
- Capacity modeling
- Cost modeling
- Designing in the Real world

Lesson 09: Quality of Service (QoS, VoIP, Security) in WiMAX

- Overview
- The challenge
- QoS measures specific to the WiMAX specs
- Security in WiMAX networks
- VoIP
- Switching
- Objections to VoIP over WiMAX
- The QoS solution
- Architecture of WiMAX VoIP

Lesson 10: Introduction to 3G Network Architecture

- Conceptual model
- Structural network architecture
- Resource management architecture
- UMTS service & bearer architecture

Lesson 11: Basics of UMTS Radio Communications

- Radio communication fundamentals
- Cellular radio communications principles
- Multiple access techniques
- Regulation
- Essentials of the 3G radio path
- Frequency band & regulatory issues
- Basic concepts
- WCDMA radio channels
- WCDMA frame structure

Lesson 12: UMTS Radio Access Network (UTRAN) & Core Network

- UTRAN architecture
- Base station
- Radio network controller
- CN Architecture in 3GPP R99
- Mobility Management (MM)
- Communication Management (CM)
- Architecture aspects in R4

Architecture aspects in R5 and above

Course Details

Lesson 17: Introducing LTE

- Why LTE and When?
- Evolution Time Line, HSDPA, HSUPA and HSPA+, LTE and LTE Advanced.
- The aims of IMT Advanced.
- LTE Capabilities and Performance.
- LTE Testing and GCF Certification.
- LTE Architecture

Lesson 18: Physical Layer: Moving Antennas On & OFDM

- MIMO Concepts
- Space Time Diversity Coding and Spatial Multiplexing
- Proposed use in LTE
- Changes to Modulation
- Turbo Coding Refresher
- Overall Description
- Benefits and Capabilities
- Evolved UMTS Terrestrial Radio Access (E-UTRA)
- Radio Channels and their Usage

Lesson 19: Layer 2: MAC, RL, PDCP, etc.

- MAC Sublayer
- RLC Sublayer
- PDCP Sublayer
- RRC
- E-UTRAN Entities
- ARQ and HARQ
- Mobility Management
- Scheduling and Rate Control

Lesson 20: Core Network & Security Aspects

- LTE Architectural Concepts
- SAE - System Architecture Evolution
- Reference Points:
- The S Series of Reference Points
- The Application Protocol Interface X2
- Handover and Mobility to Non-3GPP Technologies
- Security Principles
- Access Security Management Entity (ASME)

