

**Course Catalog  
2012-2013**

# **WiMAX & Telecommunication**



**CSLIT**

.....Connecting Technology

## WiMAX & Telecommunication

CSLiT training center specializes in providing individual and corporate trainings in the area of cutting edge next generation wireless & network technologies like NGN, WiMAX, LTE, GSM, GPRS, UMTS, SS7, Optical Fiber, Microwave, CDMA, WCDMA, 3G and 4G. Our portfolio of courses are developed utilizing the latest learning and delivery techniques that offer unrivalled development opportunities. Courses and training programs have been designed to meet the needs of individuals and corporate seeking a broad understanding of a range of modern wireless communications systems, networks and programming. These courses provide a solid understanding of telecom technologies, networks, protocols and a comprehensive knowledge about telecom solutions and supporting technologies.

### Course Objectives

After successfully completing the course attendees will:

- Understand the details of telecom networks and technologies
- Understand cellular networking (GSM/GPRS/EDGE/UMTS,CDMA)
- Understand GPRS & EDGE
- 3G system, WiMAX Network Planning , Design & Optimization
- Basic Radio & RF concept
- Microwave transmission System
- Understand optical networking
- Understand advanced data communications concepts
- Understand IP Networking
- Explore SS7, Intelligent Networks (IN) and Advanced Intelligent Networks (AIN)
- Understand Voice over IP (VoIP)
- Telecom Security, Quality & Maintenance System

Telecom power system

### 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 working in IT data networking, mobile communications, or telecoms sectors (but not mandatory).

### 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
- Relating information bandwidth to channel capacity
- Calculating gain, loss and power levels
- Calculating noise levels in radio systems
- Impact of modulation on system design and configuration
- PCM & Voice coding
- Impact of FDD, TDD, FDMA, CDMA, TDMA and OFDMA on system design
- Interpreting antenna and feeder specifications
- Radio propagation mechanisms
- Production of radio path profiles
- Calculating power budgets
- Calculating fade margins
- Diversity systems
- Planning coverage, capacity for mobile systems
- Managing radio interference
- Design a mobile radio system
- Design a fixed radio links

## Lesson 03: GSM System Engineering

- **Introduction**  
History of GSM, analogue networks, digital networks, PCS1900
- **GSM architecture**  
Mobile station Mobile Equipment (ME), Subscriber Identity Module (SIM)
- **Base Station Subsystem**  
Base Transceiver Station (BTS), Base Station Controller (BSC)
- **Network Subsystem**  
Mobile Services Switching Centre (MSC), Home Location Register (HLR), Visitor Location Register (VLR), Equipment Identity Register (EIR), Visitor Location register (VLR), Authentication Centre (AuC)
- **Radio Link Aspects**  
Bands, FDMA, TDMA, Traffic channels, Control channels, Speech coding, Channel coding and modulation, Multipath equalization, Frequency hopping

## Course Details

- **GSM Signaling**  
SS7 overview, GSM SS7 nodes, Base Station Subsystem Application Part (BSSAP), Transaction Capabilities Application Part (TCAP), Mobile Application Part (MAP)
- **Interfaces**  
Um, Abis and A interfaces.
- **Mobility and call processing in GSM**  
Attach & location update process, mobile originate, mobile termination, handovers.
- **GSM services**  
Tele services, Bearer services, supplementary services, SMS, security
- **GSM Features**  
GPRS, EDGE, UMTS

### Lesson 04: CDMA System

- Evolution of 3G network architecture
- CDMA One™ overview
- CDMA principles in 3G systems
- Access and core network elements and interfaces
- 1x and 1xEV options available for CDMA2000™
- Radio link higher-layer protocols
- Link Access Control (LAC) protocol
- Medium Access Control (MAC) protocol
- 1xEV-DO protocol stack
- 1x and 1xEV-DO channels
- 1x and 1xEV-DO physical layer structure
- System access, call processing and handover

### Lesson 05: Installation & safety

- BTS installation
- Microwave installation
- Sectorial antenna installation
- Tapping
- Safety tools
- Fault Handling
- VSWR
- Site Master
- BER test
- Commissioning

### Lesson 06: BSC & MSC

- Base Station Controller
- Hardware Structure
- RACK configuration
- BSC Equipment installed
- Maintenance & Alarm history
- Over all knowledge about BSC
- MSC overview
- MSC structure
- MSC system interface

# Course Details

## Lesson 07: Telecom power system

- Total diagram of telecom power system (three phase & single phase).
- Importance of neutral line.
- GND system.
- Rectifier system & -48VDC generation.
- Importance of -48 VDC power.
- Battery connection & battery efficient.
- External power system.
- VDT, ATS, Timer system.

## Lesson 08: Microwave transmission

- Explain the Basics of RF and Microwave
- RF Propagation and Antenna Principle
- Radio Propagation.
- Line-of-Sight Microwave, Fresnel zone
- Propagation Transmission Characteristics
- Modulation In Microwave Systems
- Interference & frequency planning
- Microwave Link Budget, System Evaluation
- Microwave network design Optimization
- Microwave radio equipment installation.
- IF, Light arrestor, IDU, ODU & DDF
- Transmission: SDH & PDH system, E1 & STM

## Lesson 09: WiMAX system

- Comparison of WiMAX against traditional BWA systems
- WiMAX standards evolution
- WiMAX architecture and reference model
- Connectivity and access network architecture
- Introduction to OFDM and OFDMA
- WiMAX single carrier configurations
- WiMAX OFDM characteristics
- 802.16 d and e frame structures
- Sub channelization and segmentation
- Permutation schemes (FUSC and PUSC)
- Capacity assignment
- Mac layer functionality
- MAC scheduling and QoS
- Encryption and security
- WiMAX signaling procedures
- 802.16e mobility enhancements
- Idle mode behavior
- Handovers

