

Course ID

**EWT**

Course Duration

**5 days**

Course Title

**Emerging Wireless Technologies**

**Related Courses**

- Introduction to Solution Framework (NGOSS) using Business Process Framework (eTOM), Information Framework (SID), and Application Framework (TAM) (3-4 days NGOSS1)
- Wireless Technologies: A Comprehensive Overview (5 days, WIRELESS)
- Future of Wireless: WiMAX, LTE, OFDM/MIMO (1-2 days, FUTURE)
- State-of-the-art of Wireless Communications for Non-engineering Professionals, Managers, and Executives (4 day(s), WIRELESS-EXEC)
- History, State-of-the-art, and Future of Wireless: Wireless Technology and Applications for Businessmen (3-5 day(s), WIRELESS-BIZ)
- LTE/4G: The Next Generation Mobile Networks (2 day(s), 3GLTE-4G)
- WiMAX: Technology, Business, and Competitive Landscape (2 day(s), WIMAX-BIZ)
- State-of-the-art of WiFi for Non-engineering Professionals, Managers, and Executives (1 day(s), WIFI)
- State-of-the-art of Satellite Communications for Non-engineering Professionals, Managers, and Executives (1 day(s), SATCOM-EXEC)
- State-of-the-art of VoIP Technology for Professionals, Managers, and Executives (1 day(s), VOIP-EXEC)
- GSM: A Technology Overview (1 day(s), GSM-B)
- iDEN™: A Technology Overview (1 day(s), IDEN-O)
- Wireless Network Structure, Operation, and Technologies (3-4 day(s), WIRELESSNET)
- Wireless Technologies: A Comparative Study (2-4 day(s), COMPARISON)

**Aimed At**

Technical and non-technical professionals and managers in OSS/BSS areas, new comers to wireless technologies, and others who need to keep up with the technologies in the rapidly evolving field of wireless communications.

**Group Size**

5-25

**Prerequisites**

You need not be an engineer but you should be comfortable with the discussion of telecommunications issues and possess some prior exposure to wireless communications.

**Course  
in a Nutshell**

GSM and its enhancements constitute the most important family of wireless technologies in terms of their subscriber base and impact. This course overviews the whole range of GSM-related technologies in terms understandable to non-wireless engineers.

Covered are the basic principles, network architecture, and functionality of GSM, GPRS, EDGE, UMTS, HSDPA, HSUPA, LTE/SAE, and OFDM/MIMO. Also covered are the reasons that led to the evolution from one step to the next and the strengths and weaknesses of each technology. The course concludes with an overview of WiMAX, which is a competitor to LTE and, like LTE, employs OFDM and MIMO.

**Customize It!**

- Are you interested in this course from the particular perspective, say that of an IT practitioner? Let us know, as we can tailor the course to suit the needs of your profession.
- Is your audience nontechnical? If so, we can focus on the technology principles, major trends, and applications/services – all in terms understandable to a lay audience.
- Are you an engineer new to wireless? We can tailor the course to a level that takes advantage of your existing technical background and discusses issues relevant to your needs.

**Learn How To**

- Understand the basic principles that underlie all wireless networks
- Explain the architecture and functionality of a GSM network
- Describe why and how GSM/GPRS evolved to EDGE
- Describe the WCDMA principles and UMTS
- Explain the workings of HSDPA and HSUPA
- Describe the SAE/LTE evolution
- Describe the application of OFDM and MIMO in LTE and WiMAX
- Describe the basics of WiMAX

**Course  
Outline**

- Historical Perspectives
  - Evolution of cellular networks
  - 3GPP standards
- GSM Architecture
  - Core network
  - Radio Network (RAN)
- Principles of Cellular Networks
  - RF coverage
  - Frequencies and frequency bands for GSM
  - Basic wave phenomena: Reflection, refraction, scattering

- Coverage and cell types: Microcells, macrocells, picocells, femtocells, umbrella cells, indoor/outdoor coverage
- Propagation models: Friis, Okomura Hata, Egli, indoor
- Calculating cellular coverage: Link budget analysis
- Frequency planning: Frequency reuse patterns
- Capacity planning: Erlang B table and telecom traffic theory
- Cell splitting
- An Overview of GSM Functionality
  - Idle mode behavior
  - Busy mode behavior
  - Handovers
  - Location updating
- GPRS Evolution
  - GSM data transmission principles
  - Inability of GSM to support high packet data traffic
  - GPRS: A packet data solution
  - GPRS air interface: Supported data rates, coding schemes
  - RLC/MAC layer
- GPRS Architecture
  - Core network nodes
  - Protocols over core
  - RAN functionality enhancement: PDP context activation, IMSI/ P-TMSI attach, session setup signaling
- EDGE Evolution
  - Enhancements on data rates over the air
  - GMSK and 8-PSK modulation schemes
  - VoIP and IMS over Edge
- 3G Network Evolution: The Path and the Need
  - 3GPP standards
  - R99 standards
  - P3 up to P6
  - P8- LTE evolution
- WCDMA Air Interface
  - Spreading principles
  - Simulation examples
  - Exercises on spreading codes
  - WCDMA scrambling codes and channelization codes
  - Tx transmission principles
  - Rx principles
  - Rake receiver
  - Logical-transport-physical channels

- Traffic examples
- UMTS Core Network
  - Soft switch emerging solution
  - ATM transport network
  - IP transport network
  - SS7 signaling over ATM & IP
- UMTS Functionality Principles
  - Idle mode behavior
  - Busy mode behavior: PS and CS traffic
  - Handovers
  - Location updating
- 3.5G solution: HSDPA/HSUPA
  - Principles and ideas
  - HSDPA fundamentals
  - EUL fundamentals
- Latest Step Up: LTE/SAE
  - 3GPP P8 release
  - EPS presentation
  - LTE radio interface
  - EPC: Core network solution
- MIMO and OFDM: Basic Principles
- WiMAX, the Competitor to LTE: WiMAX Functionality

### **How You Will Learn**

- A wireless expert, skilled in multiple technologies, will present this course in interactive lecture format.
- Along with the lecture, we will use exercises, puzzles, case studies, and interesting group activities to enrich the instruction and drive home the essential points.
- If you already know something about the technology, we will build on that existing knowledge base. We'll compare and contrast what's familiar with what's new, making the new ideas easier to learn as well as more relevant.
- If your background is less technical, we will use meaningful and ingenious examples and analogies to simplify the complex subject matter.
- You will receive a printed Participant Slides Handbook which will help you remember and retain what you learned in class and apply it on your job.

*Revised*

*Dec 15, 2009*