

Course ID  
**LTESIG**

Course Duration  
**3 days**

Course Title  
**3G LTE Signaling and Functionality**

**Related Courses**

- 3G LTE: Technology, Business, and Competitive Landscape (LTE-BIZ, 2 days)
- 3G LTE Air Interface Techniques (LTEAI, 3 days)
- 3G LTE Advanced System Techniques (LTE-ADV, 4 days)
- 3G LTE Planning Considerations (LTEPLAN, 4 days)

**Aimed At**

Technical audiences with prior knowledge of WCDMA, HSDPA/HSUPA, and an overview of 3G LTE.

**Group Size**

5-25

**Prerequisites**

- LTE/SAE: A Technology Overview (3 days, LTE-TECH)
- UMTS-FDD: Network Architecture, Operation, and Design (3 day(s), UMTS-FDD)
- HSDPA: Network Architecture, Operation, and Design (2 day(s), HSDPA)
- HSUPA: Network Architecture, Operation, and Design (2 day(s), HSUPA)

**Course in a Nutshell**

This is the second one in our series of courses on 3G LTE/4G aimed at technical audiences. The first one, LTE/SAE: A Technology Overview, is a recommended prerequisite.

This course provides detailed information on the signaling layers in LTE air interfaces including the channel structures and the mapping up to the physical layer. The idle mode and connected mode functionalities are discussed in details as are the issues related to Radio Resource Management (RRM), Mobility Management (MM), and scheduling over the air interface.

**Customize It!**

- For those who have a good wireless technologies background but lack prior exposure to WCDMA/HSPA, we can extend the course to five days to allow us to cover the prerequisite material before getting on with the content of this course.
- Let us know if you are a radio/core network engineer, application/device designer, project manager, etc., so we can focus on the aspects of the technology most pertinent to your job requirements.
- Add a workshop day at the end of the course, for a total of 4 day, for a deep dive into the transmission network IP backbone issues.

## Course Outline

- LTE/SAE Introduction
  - How we got here: A brief overview of cellular
  - 3GPP Releases (Release 99 to Release 8)
  - EPS (E-UTRAN and EPC) logical architecture
  - EPS interfaces
  - EPC (Evolved Packet Core) architecture
  - SAE/LTE interfaces
- Radio Interface Principles
  - Channel models
  - BPSK, QPSK, 16QAM, 64QAM
  - OFDM: Principles of operation
  - MIMO systems overview
  - Radio interface techniques: Uplink/downlink
  - Channel structure
  - Exercises
- Radio Interface Layers
  - Radio procedures
  - Radio Resource Control (RRC)
  - Packet Data Convergence Protocol (PDCP)
  - Radio Link Control (RLC)
  - Medium Access Control (MAC)
  - Packet data flow and multiplexing
  - Channel structure : Logical channels, transport channels, physical channels
  - 3GPP standards references
- LTE Idle Mode Functionality
  - Idle mode
  - RRC states on idle mode
  - PLMN selection
  - Cell selection process: Criteria, normal camping
  - Cell reselection evaluation process
  - System information
  - Paging: DRX for paging
  - Inter-frequency cell reselection
  - Intra-frequency cell reselection
  - Inter-RAT cell reselection
  - SUBframe patterns
  - Network compatibility (2G measurements RSSI, 3G measurements, WIMAX compatibility)
  - Exercises
- LTE Connected Mode: Physical Layer Procedures
  - Radio link monitoring
  - Intercell synchronization

- Downlink transmission
- L1 and L2 control signaling
- Physical layer
- Power control: Timing adjustments
- Link adaptation
- Uplink transmission
- Physical resources
- Random access
- Preamble selection
- Channel Quality Indicator (CQI)
- Precoding Matrix Indicator (PMI)
- Rank Indicator (RI)
- Exercises
- Scheduling and Resource/Mobility Management
  - RRM functionality
  - RRM measurements
  - Uplink/downlink scheduling
  - Mobility management
  - Best cell evaluation
  - System interworking with 2G/3G
  - LTE attach procedures
  - LTE connection set-up procedure
  - Exercises
- Course Wrap-Up

### **How You Will Learn**

- A highly experienced wireless technologies expert/instructor will present this course in interactive lecture format.
- Along with the lecture, we make extensive use of exercises, case studies, and group activities to get the important points across and make the class interesting.
- If you already know something about the technology, we will build on that base. We'll compare and contrast what's familiar with what's new, making the new material easier to master.
- If your background is less technical, we will use examples and analogies to reduce the subject matter complexity.
- You will receive a printed Participant Handbook which will help you remember and retain what you learned in class and apply it back on your job.

*Revised*

*June 8, 2009f*