

Course ID

LTEAI

Course Duration

3 days

Course Title

3G LTE Air Interface Techniques

Related Courses

- 3G LTE: Technology, Business, and Competitive Landscape (LTE-BIZ, 2 days)
- 3G LTE Advanced System Techniques (LTE-ADV, 4 days)
- 3G LTE Signaling and Functionality (LTESIG, 3 days)
- 3G LTE Planning Considerations (LTEPLAN, 4 days)
- HSDPA: Network Architecture, Operation, and Design (HSDPA, 2 days)
- HSUPA: Network Architecture, Operation, and Design (HSUPA, 2 days)

Aimed At

Technical audiences who have a good understanding of WCDMA/UMTS and some prior exposure to 3G LTE and who wish to study the LTE air interface in depth.

Group Size

5-25

Prerequisites

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

The UMTS course, or equivalent knowledge/experience, is a required prerequisite for this course. LTE overview is a recommended prerequisite but not mandatory.

Course in a Nutshell

This course will undertake an in-depth study of the 3G LTE air interface. The course will begin with a discussion of the radio channel environment and the related RF propagation issues to help you understand the problems that OFDM/MIMO solve. This is followed by a discussion of the modulation principles along with a detailed look at the 3G LTE physical layer structure as it complements the modulation and MIMO channels. The transmitter and receiver parameters and techniques, based on the 3GPP specifications, are then presented. The course concludes with a discussion of the physical layer procedures with emphasis on the channel quality and random access techniques.

Customize It!

- If you lack the necessary WCDMA/LTE background, we can teach an extended five-day course that includes WCDMA principles, 3G LTE overview, and 3G LTE air interface techniques.
- Add a workshop day at the end of the course, for a total of four days, for a deeper dive into capacity planning and coverage calculations.

Course Outline

- LTE/SAE Introduction
 - Evolution of cellular networks
 - 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
 - Propagation conditions
 - Channel models
 - Frequency selective channels
 - Time dependant radio channels
 - Multipath radio conditions: Delay, Doppler spectrum, multi-antenna channel model
 - Macrocell propagation model: Urban case
 - Macrocell propagation model: Rural case
 - Exercises
 - Modulation principles
 - BPSK, QPSK, 16QAM, 64QAM
 - OFDM: Principles of operation
 - MIMO system
 - Exercises
 - LTE radio interface techniques
 - Radio Interface techniques: Uplink/downlink
 - Radio channel structure
 - Radio interface
 - Exercises
- UE Transmitter/Receiver: Technical Characteristics
 - Power transmission
 - GSM and WCDMA short transmitter presentation
 - LTE transmitter/receiver functional blocks: channel coding, multiplexing and interleaving, CRC codes, turbo codes
 - Maximum output power (MOP)
 - UE power classes
 - Transmitter characteristics: Maximum Power Reduction (MPR), power control, MOP, transmit on/off power, out of synch output power, bandwidth requirements and allocation, out of band emission, spurious emission
 - Receiver diversity characteristics
 - Receiver sensitivity: Reference level, Maximum Sensitivity Reduction (MSR)
 - Maximum input level
 - Adjacent channel selectivity
 - Blocking characteristics
 - Inter-modulation characteristics

- Receiver performance
- Dual antenna receiver
- Physical Layer Procedures
 - Synchronization procedures
 - Timing synchronization
 - Radio link monitoring
 - Intercell synchronization
 - Power control: Uplink/downlink
 - Random access procedures: Preamble selection
 - Channel quality: Channel Quality Indication (CQI) Report
 - Precoding Matrix Indicators (PMI)
 - Rank Indicator (RI)
- Course Wrap-up : Recap and Discussion

How You Will Learn

- An experienced wireless technologies subject matter expert will present this course in interactive lecture format.
- Along with the lecture, we make use of group discussions, case studies, and exercises to elucidate and enrich the course material.
- If you already know something about 3G LTE, we will build on your existing knowledge. We'll compare and contrast what's familiar with what's new, making the new concepts easier to acquire as well as more relevant.
- If your background is less technical, we will use interesting examples and analogies to simplify the more difficult concepts.
- You will receive a printed Participant Handbook which will help you reference and apply what you learned in class.

Revised

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