

Course ID

**3GLTE-4G**

Course Duration

**2 days**

**Related Courses**

Course Title

**3G LTE/4G: The Next Generation Mobile Networks**

- HSDPA: Network Architecture, Operation, and Design (HSDPA, 2 days)
- HSUPA: Network Architecture, Operation, and Design (HSUPA, 2 days)
- UMTS-TDD: Network Architecture, Operation, and Design (UMTS-TDD, 2 days)

**Aimed At**

This course is aimed at those with background in GSM and UMTS who wish to understand how these networks will evolve as part of the long-term evolution of the 3G wireless technologies. The standard presentation of this course assumes a bachelor of science in Electrical Engineering, Mathematics, Physics, or a related subject along with an appropriate background in communications and 3G

**Group Size**

5-25

**Prerequisites**

- GSM: Network Architecture, Operation, and Design (GSM-I, 5 days)
- UMTS-FDD: Network Architecture, Operation, and Design (UMTS-FDD, 3 days)
- 1xRTT: Network Architecture, Operation, and Design (1XRTT, 2 days)
- 1xEVDO: Network Architecture, Operation, and Design (EVDO, 2 days)
- WiMAX: The Technology (WIMAX-TECH, 2 days)

**Course in a Nutshell**

This course seeks to provides insight into the development 3G LTE and 4G, the next generation of mobile networks.

3G LTE, which stands for 3G Long Term Evolution, is being standardized by 3GPP and 3GPP2 and is often described as “3.9G”. It is a technology that will enable cellular networks to support up to 10 times higher data rate and more users than existing HSxPA networks. It will employ OFDM and MIMO technologies which will allow mobile operators to offer true “quad play” services, i.e., voice, high-speed, IPTV and full mobility. 3G LTE is designed to provide a simple evolutionary path for UMTS operators as they migrate from UMTS to HSDPA to HSUPA and then onto 3G LTE, also called HSOPA.

4G is the successor to the wireless access technologies of the 3G era. To cater to the QoS and data rate requirements of the forthcoming applications such as High Definition TV and DVB, 3GPP and IEEE (which are along the 3GP working groups), have decided that 4G should be very spectrally efficient, should dynamically share and utilize the network resources, have a high data rate and capacity larger than 3G, have smooth handovers across heterogeneous networks, and should be based on an all-IP packet switched network. Several telecom equipment giants are currently testing 4G communication at 100Mbps while moving and 1Gbps while stationary.

The course covers the fundamental principles of 3G LTE and 4G, such as MC-

CDMA, OFDM and OFDMA as well as MIMO, IPv6, AMC and Software Defined Radios. Discussed are the overall architecture, protocols, RF planning and considerations as well as 4G services infrastructures that will enable very high data rate wireless broadband services.

**Customize It!** Are you a 3G LTE/4G radio planner, equipment designer, or software developer? Let us know the reason for your interest in these technologies, and we will customize the course to fit your particular needs.

If you are concerned more with strategies, applications/services or management issues, we can tailor the course to emphasize those aspects.

If you are interested in some of the particular technologies that are part of the 3G LTE/4G mix, we can customize the course to focus on one or more of the following: MC-CDMA, OFDM/OFDMA, MIMO, or SDR.

**Learn How To**

- Get detailed insight into the state of the technical art of 3G LTE and 4G mobile radio networks
- Understand fundamental building blocks of 3G LTE/4G
- Understand the 3G LTE /4G architecture
- Understand the different protocols involved in achieving high data rates in 3G LTE/4G
- Learn how OFDM, MIMO and SDR work
- Learn all about the 3G LTE/4G air interface
- Learn the operation of handovers over heterogeneous networks
- Learn the evolution path to 4G services

**Course Outline**

- Beyond 3G Wireless
  - HSDPA
  - HSUPA
  - Fixed-mobile convergence
  - Radio spectrum economics
  - Ubiquity
  - 4G mobile communications
- 3G LTE
  - What is 3G LTE
  - Characteristics
  - Technologies used
  - Architecture & protocols
  - 3G LTE services
- 4G Wireless
  - 4G wireless defined
  - Standardization bodies
  - Radio spectrum
  - 4G implementation and trials
  - 4G characteristics

- 4G capabilities and services
- Technological challenges
- 3G LTE/4G Radio Interface
  - Advanced multiple access techniques
  - Advanced modulation
  - Advanced coding techniques
  - 4G packet schedulers
  - MC-CDMA
  - OFDM
  - OFDMA
  - MIMO
  - SDR
  - 4G radio transceiver architectures
- 4G Mobility Considerations
  - Radio access
  - Handovers
  - Intersystem handovers
  - Interfrequency handovers
  - Universal and network agnostic roaming
  - Seamless connectivity
  - Ubiquitous access
- 4G Core Network
  - Possible architectures
  - Convergence of fixed and mobile access
  - Heterogeneous traffic management
  - QoS issues
  - Radio resource management
  - Mobility management
  - Throughput
  - Latency
  - Harmonized all-IP network infrastructure
  - IPv4 and IPv6
  - Operator service and access management
- 4G Radio Planning
  - OFDM channel planning
  - OFDMA planning
  - MIMO configurations
  - Planning for seamless mobile access
- Advanced Services for 3G LTE and 4G
  - Service architectures
  - IP and SIP based services
  - Security aspects
  - 3G LTE service business models and scenarios
  - 4G service business models and scenarios

**How You Will  
Learn**

- A seasoned instructor will present this course in interactive lecture format
- Along with lecture, we 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. We'll compare and contrast what's familiar with what's new, making 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 Handbook which will help you remember and retain what you learned in class and apply it on your job.

*Revised*

*Nov. 13, 2006*