The major focus of this course is the interworking between UMTS/HSPA and LTE. The course begins with a brief overview of LTE and 3GPP 2G/3G network architectures and requirements for interworking. The building blocks that support interworking between LTE and UMTS/HSPA are discussed in detail, including the new interfaces, hybrid device capabilities, and radio/core network mechanisms. Different interworking/mobility scenarios are listed and detail message flows are given. LTE is optimized for the delivery of IP services including VoIP. It can also cooperate with 2G/3G CS (circuit-switched) call to support Single Radio Voice Call Continuity (SRVCC) and CS Fallback. The course also previews IP mobility mechanism, security, and QoS considerations. In summary, the course provides both the architectural features and the detail message flows of the interworking between LTE and 3GPP 2G/3G.

Intended Audience
This course is designed for those involved in the evolution and migration of UMTS/HSPA networks to LTE networks. It is suitable for planners and engineers responsible for network planning, design and deployment, integration and network operations.

Learning Objectives
After completing this course, the student will be able to:
- Sketch the LTE architecture, including interfaces to GERAN/UTRAN
- Describe components/interfaces that make up the LTE core network and their roles in the interworking
- List requirements for LTE and 2G/3G interworking
- Sketch interworking architecture of LTE and GERAN/UTRAN
- List the building blocks for LTE and GERAN/UTRAN interworking and explain them
- Walk through an LTE session setup
- Enumerate the steps involved in idle mode mobility
- Walk through steps of an active mode handover
- Define SRVCC and CS Fallback in LTE

Suggested Prerequisites
- LTE Overview (eLearning)
- LTE SAE Evolved Packet Core (EPC) Overview (eLearning)
- Mastering LTE (Instructor Led)

Course Outline
1. LTE and 3GPP 2G/3G Networks
   1.1. LTE/EPC network architecture
   1.2. 2G network architecture
   1.3. 3G network architecture
   1.4. Requirements for LTE interworking with 2G/3G
2. Interworking Architecture
   2.1. Interverworking architecture
   2.2. Interverworking interfaces and protocols
   2.3. Roles of nodes such as MME, S-GW, P-GW, HSS, SGSN
3. Building Blocks of Interworking
   3.1. Inter-Technology communication
      3.1.1. Interfaces (S3, S4, S12, Gn, Gp, Gr)
      3.1.2. RAN information management procedure
      3.1.3. Delivery of system information
      3.1.4. Convey the handover command
   3.2. Hybrid device capabilities
   3.3. Radio access network features
      3.3.1. Measurements control and report
      3.3.2. Handover algorithms
   3.4. Core network mechanisms
      3.4.1. IP mobility management mechanism
      3.4.2. Security/QoS consideration
4. Initial Session Setup
   4.1. Access network discovery and selection
   4.2. Attach procedure
   4.3. PDN GW selection
5. Interworking/mobility scenarios and message flows
   5.1. LTE <-> UTRAN handover
   5.2. LTE <-> GERAN handover
   5.3. Idle mode cell reselection
6. LTE <-> 2G/3G CS interworking
   6.1. IMS overview
   6.2. Single Radio Voice Call Continuity (SRVCC)
   6.3. LTE ->2G/3G CS handover
   6.4. LTE Fallback on 2G/3G CS