# HSPA, HSPA+ & Beyond (3 days)

3GPP Release 5, 6, 7 & 8 introduce HSPA & HSPA+ technology that include new DL/UL transport channels and features including MIMO to enhance support for high-performance packet data applications. HSPA+ doubles the data speed supported by HSPA. This course provides a good understanding of HSDPA, HSUPA & HSPA+ air interface features, protocol (e.g. RLC, MAC) changes & dual carrier technology. A good knowledge of 3GPP UMTS would be beneficial for anyone attending this course.

## Who Should Attend

This is advanced level course and suitable for telecom professionals including design, testing , support & sales engineers who already have good understanding of UMTS technologies.

## Objective

After completing this course, the audience will be able to:
- Understand HSPA/HSPA+ features
- Describe MIMO & Dual-Cell concepts
- Describe protocols (e.g. RLC, MAC) changes
- Explain Signaling enhancements

## Course Contents

**UMTS Overview**

**HSDPA**

**Introduction**
- HSDPA Overview
- HSDPA Enhancements
- Architecture

**HSDPA Features**
- Shared channel transmission
- Adaptive Modulation and Coding (AMC)
- H-ARQ
- Fair and fast scheduling at Node B
- Fast cell selection (FCS)
- Short transmission time interval (TTI)

**HSDPA Channels**

**HSDPA Protocol Architecture**

**MAC Architecture**

**HSDPA Operations & Mobility Procedures**

**HSUPA**

**Introduction**
- HSUPA Overview
- HSUPA Enhancements
- UMTS Architecture with HSUPA

**HSUPA Features**
- Multi code transmission
- Short Transmission Time Interval
- Fast hybrid Automatic Repeat reQuest
- Fast scheduling

**HSUPA Channels**

**UTRAN Iub/Iur Protocol Aspects**

**HSUPA Protocol Architecture**

**MAC Architecture**

**HSUPA Operations & Mobility Procedures**
- HSUPA Serving cell change
- Intra-Node B Synchronised serving E-DCH cell change
- Soft Handover

**HSDPA/HSUPA Terminals**

**HSPA+ & Beyond**

**HSPA+ Overview**

**Throughput Enhancement Features**
- Multiple Input / Multiple Output (MIMO)
- Continuous Connectivity for Packet Data Users (CPC)
- 64 QAM for HSDPA in DL
- 16 QAM for HSUPA in UL
- Improved Layer-2 Support
- **Evolved HSPA Architecture**

**Latency and Power Enhancement Features**
- Continuous Connectivity (CPC)
- Enhanced Cell FACH

MAC Enhancements

Interworking with legacy UTRAN nodes

**Release 8 enhancements**
- Dual-Cell HSDPA operation on adjacent carriers
- 64QAM and MIMO for HSDPA
- Improved L2 for uplink
- Enhanced Uplink for CELL_FACH
- Enhanced UE DRX for FDD
- HSPA VoIP to WCDMA/GSM CS continuity
- HS-DSCH Serving Cell Change Enhancements

HSPA+ Release 9 enhancements