



**Course Outline for the Training Course on
LTE Network Designing and Planning**

Duration: 3 Days

+92 51 873 4525 | info@track4solutions.com | track4solutions.com

506-A, 5th Floor, Evacuee Trust Complex, F-5/1, Islamabad, Pakistan

Title: LTE Network Designing and Planning

Duration: 3 days

Course Code: NSE-WLS-605

Course Description:

This Course is designed to provide detailed knowledge and understanding on Network Designing and planning principles for Long Term Evolution – LTE system. This course helps participants understand the planning processes for LTE including Network Dimensioning, Coverage, Capacity, Traffic Density Estimations, and Frequency planning. Participants will be able to realize via selective exercises the impact of selections on the network performance, and through the process the participant shall learn the techniques to optimize network design and planning to optimize performance.

Course Objective and key benefits:

- ✓ Describe the features and Benefits of LTE
- ✓ Understand Network Design and planning Principles
- ✓ Understand the Traffic Requirements and QOS of LTE
- ✓ Understand the Propagation Requirements of LTE
- ✓ Understand Difference of Antennas
- ✓ Learn optimized Antenna configuration procedures
- ✓ Learn Frequency characteristics and Respective Coverage Requirements
- ✓ Learn Site Selection Procedures for LTE

Pre Requisite

- ✓ Knowledge of 2G/3G.
- ✓ Good Understanding of LTE

Who Should Attend?

Engineers / Technicians /Network Designers & Planners / Design & Deployment Engineers/ Network Integration & operations Engineers/ Research and Development personnel

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Course Outline:

- I. LTE Network Design and planning
 - A. Mobile Network Evolution Line
 1. 3GPP Releases prior to LTE
 2. LTE System Architecture
 3. Interfaces
 - B. LTE Radio Network Design
 1. Network Design Goals, Inputs, Outputs
 2. Planning processes of LTE
 - i. Network Dimensioning
 - ii. Coverage
 - iii. Capacity
 - iv. Traffic Density Estimation
 - v. Frequency and Configuration planning
 3. Network Optimization Process
 4. Financial and Regulations basics
 - C. Traffic Conditions of LTE
 1. LTE QOS Definition
 2. LTE System Capabilities
 3. FDD and TDD issues
 4. Service Mobility Conditions
 5. LTE interworking and backward compatibility
 - D. LTE Propagation Requirements
 1. LTE Spectrum needs
 2. Radio Propagation Principles
 - i. Free Space Loss,
 - ii. Radio Propagation Effects
 - iii. Multipath Propagation
 3. Interference Issues of Downlink/Uplink OFDM Techniques
 4. Propagation Models

5. UE and eNB Transmitter and Receiver Requirements.
 6. Performance Impact of Modulation and Coding
 7. Regulatory RF Requirements.
 8. eNB Implementation Gains and Losses.
 9. E-UTRA Link Budgets for DL/UL.
 10. X2 Interface Implementation advantages
 11. LTE Frequency Re-use Selection
 12. Uplink and Downlink E-UTRA Link Budgets
 13. Cell Interference Mitigation methods.
- E. LTE Considerations for Antennas
1. Selection Options
 2. Properties of Antennas
 - i. Antenna Gain
 - ii. Size and Beam-width
 - iii. Polarization Options
 - iv. Front-to-Back Ratios
 - v. Ports
 3. LTE Diversity Options
 4. Single User, Multiuser MIMO – SU-MIMO, MU-MIMO
 5. MIMO Implementation Considerations
 6. Smart Antennas
 7. eNB Options
 8. Impact to LTE Link Budget and Capacity
 9. Multi band and Multi Mode Antennas
- F. LTE Coverage Design and Planning Principles
1. Example Scenarios for Frequencies- 850, 900, 1800, 1900, 2100 and 2500MHz
 2. Link Budgets for Different Bands and MCS Schemes
 3. Re-Farming of Frequency
 4. LTE Coverage in comparison to GSM and UMTS
 5. Relating Coverage
 6. Capacity and Interference
 7. Reference Signal Planning Options

8. Combining Capacity and Coverage Planning
 9. Impact of Antenna Configuration
 10. Impact of Normal and Extended Cyclic Prefix
 11. Key Measurements - RSSI and RSRP
 12. Planning Tool Configuration - Defining LTE Parameters
 13. Configuring and Optimizing the Handover Region
 14. Factors Relating to LTE Power Control and Timing
 15. LTE Indoor Planning Methods
 16. Physical Layer 1 Reporting
 17. Drive Testing LTE Networks
 18. KPI's for LTE Planning
- G. LTE Capacity planning principles
1. Cell Planning for Capacity Limited Networks
 2. Site and Sector Capacity and the Effects of Modulation and Coding Schemes
 3. Cell Capacity and affecting factors
 4. Bandwidth and Implementation Options and their Effects
 5. Capacity Planning with MIMO Systems
 6. Planning for Subscribed Services and Oversubscription
 7. Planning Tool Inputs
 - i. Service Configurations
 - ii. Device Capabilities
 - iii. eNB Configuration Options
 8. Antenna Configuration and its Impact
 9. Planning Tool Simulations
- H. LTE Site Selection Precedure
1. Criteria for Site Selection
 2. Site Re-use Options
 3. Design Considerations
 - i. Clipping Distances
 - ii. Site to Site Distances
 - iii. Antenna Tilts
 - iv. Gaps in Coverage

- v. Relation to Clutter Height
- vi. Site Sharing
- 4. eNB to eNB Integration
- 5. eNB to EPC Integration
- I. RAN Configuration and Optimization Considerations
 - 1. Self-Optimization Systems
 - 2. Parameter Configuration for Interworking with GSM and UMTS
 - 3. Cell Selection and Re-selection Optimization
 - 4. RRC Event Configuration for Handover Parameter Optimization
 - 5. Power Control Optimization - PUCCH, PRACH and PUSCH.
 - 6. Paging Optimization
 - 7. Cell Access - PRACH Optimization
 - 8. Feedback Configuration