

Course ID	Course Title
5GETND	5G Enhancements for Tactical Network Deployment
Course Duration	
2-4 days	
Aimed At	Corporate and government personnel whose job requires an understanding of the <i>5G Enhancements for Tactical Network Deployment</i> .
Prerequisites	The <i>5G Enhancements for Tactical Network Deployment</i> course requires a good prior understanding of the 5G wireless technologies.
Course in a Nutshell	<i>5G Enhancements for Tactical Network Deployments</i> , a comprehensive 2-day course, covers topics such as high mobility in 5G, MANET enhancements, LPI/LPD, jamming in 5G NR, security considerations, non-public network deployment options, and interworking with P25. The course can be conducted WebLive™ (instructor-led online) or onsite. It's available worldwide.
Customize It!	We can tailor the included topics, tech level, and duration of <i>5G Enhancements for Tactical Network Deployments</i> to your team's technical requirements.
Outline	High Mobility in 5G <ul style="list-style-type: none">○ Doppler: What is Doppler?<ul style="list-style-type: none">▪ Relation between Doppler and coherence time○ Doppler frequency shift compensation<ul style="list-style-type: none">▪ Frequency pre-compensation○ Doppler estimation for high speed OFDM○ Doppler in NTN<ul style="list-style-type: none">▪ Satellite channel model▪ Doppler for LEO satellites▪ Doppler compensation○ Doppler in 5G○ Location-aware Doppler compensation for 5G○ Multi-antenna solutions for Doppler compensation○ Doppler in 5G mmWave MANET Enhancement <ul style="list-style-type: none">○ Mobile Ad-Hoc Networks (MANET)<ul style="list-style-type: none">▪ History and applications▪ Challenges▪ Technical requirements○ MANET routing protocols<ul style="list-style-type: none">▪ Ad-Hoc On-demand Distance Vector (AoDV)

- Dynamic Source Routing (DSR)
- Zone Routing Protocol (ZRP)
- MANET security
 - Security challenges
 - Security performance analysis
 - Security attacks in MANET
 - Security mechanisms
- Recent advances in MANET
 - MANET frequencies
 - SDR for MANET
 - MANET with Advanced Radio Evolution (like MIMO)
 - Multi-UAV probability hypothesis
 - Machine learning and deep learning approaches
- MANET in 5G NR
 - Side link
 - Smart IOT
 - V2X
 - Smart healthcare
 - Energy-saving MANET routing in 5G
 - 5G machine to machine communications

LPI/LPD

- Low Probability of Interference (LPI)
- Low Probability of Detection (LPD)
- LPA/LPD aware routing for MANET
- LPI/LPD for signal interception
- LPI/LPD in SATCom

Jamming in 5G NR

- 5G NR vulnerabilities
 - Jamming
 - Spoofing
 - Sniffing
- Jamming mitigation in 5G NR
- Jamming in 5G military scenarios
 - Jamming techniques
 - 5G military anti-Jamming
- Detection of jamming using deep learning

Security Considerations

- Basics of security mechanisms
 - IPSEC

- Symmetrical and asymmetrical encryption
- Authentication; TLS versions
- How does SSH work
- What is HTTPS
- 5G NR security, radio layer
- 5G NR security, network layer
- Security for 5G NR private network
- Zero Trust security architecture

Non-Public Network Deployment Options

- NPN with different RATs
- NPN in different spectrum ranges
- Multiple SNPN radio coordination
- Multiple SNPN core network coordination

Interworking with P25

- Basics of P25 / LMR
- LTE–LMR interworking
 - LTE interworking framework (ePDG)
 - Interworking with LMR/P25
- 5G NR –LMR interworking
 - 5G NR interworking framework (N3IWF)
 - Interworking with LMR/P25

DCN MjTL-f