Course ID	Course Title
5GRPDT	5G RAN Planning & Dimensioning Training

Course Duration

4-5 days

Aimed At

5G RAN Design & Dimensioning Training is aimed at technical professionals responsible for 5G RAN design.

Prerequisites

5G New Radio Training
5G Wireless Training, Layers 1, 2, 3

Related Courses

- *5G New Radio Training* (5G-NR, 2-3 days)

- *5G Radio Network Technology Training* (5G-NET-TECH, 3-4 days)

- *5G Wireless Training: Layers 1, 2, 3* (5G-TF1, 4-5 days)

- *5G RAN Training: Technology & Planning* (5GTUTE, 5 days)

- *5G Wireless Technology/Applications* (5GTA, 5 days)

- *5G Wireless Priority Services Training* (5G-PRIOR1, 3-5 days)

Course in a Nutshell

5G RAN Planning and Dimensioning Training takes *a* deep dive into 5G technology and 5G System architecture. It offers an understanding of the opportunities, challenges, and risks to allow you to effectively exploit the technology. It teaches how to maximize network capacity, evaluate service quality, optimize usage of radio networks, and enhance data transmission. We can also, optionally, discuss the deployment planning considerations for LTE-A to 5G, 5G over Satellite (non-terrestrial), and optical (Li-Fi) 5G

Customize It!

We can tailor the included topics, tech level, and duration of 5G *RAN Planning & Dimensioning Training* to your team's technical requirements.

5G RAN Planning & Dimensioning Training: 5G Radio Technology Review

- *5G New Radio (NR) Technology Review*

  - LTE Air interface overview
  - Scalable numerology
  - NR frame structure
  - FDD – TDD modes
  - NR signals and channels review
  - Non-Stand-Alone (NSA) vs. Stand-Alone (SA) architecture
  - 5G Services: eMBB, massive IoT, URLLC
  - LTE to 5G MIMO review
  - 3GPP Massive MIMO standardization
  - Beam-forming principles
  - Massive MIMO beamforming gain: Practical approach
  - Active Antenna Systems; Active Antenna Units

- *5G Channel Modeling*

  - Mobile channel model: General principles
  - Non-Line of Sight and Rayleigh modeling
  - LoS and Rice modeling
  - Shadow modeling
  - Site modeling: Macro, micro, pico
  - Doppler effects and channel models
  - Pathloss models (3.6-3.8 GHz, 5-6 GHz, mmW 30 GHz, 60 GHz)
  - Example: Link budget analysis overview; various cases (rural, urban, dense urban, O2I)
  - Exercise: Link Budget calculations using Excel

5G RAN Planning & Dimensioning Training: Basic on Standalone Planning

- *Uplink Planning*

  - Network quality requirements
  - Vendor (equipment) requirements
  - RACH and RACH success probability
  - Power control factor
  - Uplink Interference factor: Optional features for Interference mitigation
  - Coverage planning for PUSCH channel
  - Coverage planning for control channels (PUCCH, RACH)
  - Coverage planning for signals (SRS, DMRS)
  - Capacity calculations – single service

- Capacity calculation – combined services
- UL throughput calculation (average, cell edge) vs SINR

- *Downlink Planning*

  - Network quality requirements
  - Equipment requirements
  - Power gain calculation
  - Interference factor: Optional features for Interference mitigation
  - Coverage planning for PDSCH channel
  - Coverage planning for control channel PDCCH
  - Coverage planning for signals (PSS, SSS, PBCH, DMRS)
  - Capacity calculations – single service
  - Capacity calculation – combined services
  - DL throughput calculation (average, cell edge) vs SINR.

5G RAN Planning & Dimensioning Training: SA Scenarios
- eMBB service planning
- massive IoT service planning
- URLLC service planning
- Mixed Service planning
- Mobility scenarios and capacity planning
- Notification area capacity planning
- PUCCH/PDCCH capacity planning

5G RAN Planning & Dimensioning Training: NSA Scenarios
- NSA deployment
- NSA capacity and coverage
- NSA mobility planning

5G RAN Planning & Dimensioning Training: 5G Special Deployment Planning

- Small cell approach (available optional features)
- Planning LTE-A for 5G coverage: NSA Link budget analysis up to 5GHz spectrum
- Planning Li-Fi parameters and channel modeling
- NB-IoT technology air interface description (MAC and physical layer)
- NSA LTE-A planning for IoT coexistence: Capacity and coverage
- Improving RACH accessibility for LTE-A and IoT
- Optional discussion:
  - Li-Fi small cells indoor planning: Coverage and capacity considerations

- 5G NB-IoT over satellite: Technical requirements and ITU recommendations
- 5G NB-IoT over satellite: Recommended parameter and planning configurations

5G RAN Planning & Dimensioning Training: Wrap-up: Recap and Discussion

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