Course ID
5G-NR
Course Duration
2-3 days

Course Title
5G New Radio Training

Aimed At

5G New Radio Training is aimed at Technical and management personnel whose job requires an understanding of the evolving 5G technology.

Prerequisites

A good understanding of the LTE/LTE-A air interface as well as OFDM principles are necessary to benefit from *5G New Radio Training.*

Related Courses

- *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)
- *5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features* (5G-SEC-ST, 3-4 days)

Course in a Nutshell

5G New Radio Training explores the radio technology involved in 5G RAN New Radio (NR), the physical layers procedures, and the principles of Massive MIMO and MIMO/Beamforming techniques. Since the OFDM concepts are vital to 5G, a detailed discussion of this technology is included as well.

Customize It!

We can tailor the *5G New Radio Training* to include the LTE/LTE-A prerequisite material (if your team needs it), add or omit topics to suit your team's needs, or to adapt it to a less technical, more business-oriented audience. The course can also be extended to include hands-on exercises.

Course Outline

- **5G New Radio Training Part 1 - 5G: An Introduction**
  - What is 5G
  - Why 5G?
  - Roadmap to 5G
  - End-to-end 5G ecosystem

- **5G New Radio Training Part 2 - 5G: New Radio (NR) Physical Layer**
  - NR channel structure
  - Relation to LTE
  - OFDM principles (basic introduction, signal generation)
  - OFDM signal processing (channel coding and FEC)

- Why flexible numerology?
- NR slot structure
- The new concept of bandwidth part (BWP)
- How 5G differs from 4G
- 5G requirements for RAN: Bandwidth, power, spectral efficiency, new technology adaptation, latency, signaling load, capacity, coverage, interference, mobility
- 5G requirements for Core: Network topology, cloud architectures, big data analytics
- 5G service platforms

- **5G New Radio Training Part 3 - 5G 3GPP Physical Layer Procedures**

    - 3GPP Physical layer procedures for control signaling
    - Synchronization signals and reference signals structure
    - Cell search procedure
    - SS/PBCH structure
    - Random access preamble formats - initial beam establishment
    - Downlink control signaling
    - Uplink control signaling
    - Overview power control
    - Overview transmit timing control
    - 3GPP Physical procedures for user data transmissions
    - Reference signals (DMRS, CSI-RS, TRS, PTRS, SRS)
    - MAC HARQ codebook principles
    - Code Block Group (CBG) based retransmissions
    - Scheduler functionality for UL and DL
    - Scheduler resource allocation (time-frequency grid)

- **5G New Radio Training Part 4 - 5G MIMO – Beam forming**

    - Massive MIMO general introduction
    - Beamforming and spatial multiplexing principles
    - MIMO/Beamforming modules
    - Codebook vs non-codebook transmissions
    - The new concept of Grid of Beams (GoB)
    - Analog vs. digital beamforming

- **5G New Radio Training - Course Recap and Discussion**

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