

5G Fundamentals with MATLAB

OEM: MathWorks • Duration: 2 Days (16 hrs) • Code: MW-5G-FUNDAMENTALS-WITH-MATLAB

COURSE MODULES & TOPICS

Day 1 of 2

Motivation and Requirements for 5G

- 5G use cases
- 5G requirements
- 5G deployment scenarios

OFDM Theory Review

- Motivation for multi-carrier vs single-carrier
- Introduction to OFDM
- Generation of OFDM symbols using the IFFT
- Cyclic prefix (guard interval)
- Windowing to reduce out of band emissions
- Advantages and disadvantages of OFDM
- SC-FDMA review

5G NR Waveforms

- Wireless Waveform Generator App
- 5G waveforms
- 5G frame structure: carriers and bandwidth parts
- 5G numerology: subcarrier spacing

5G MIMO Background

- Spectral efficiency and capacity
- Beamforming
- Spatial multiplexing
- Singular value decomposition
- Equalizing, predistortion, precoding, and combining

5G NR Data Channels

- DL-SCH and PDSCH processing chains
- PDSCH allocation and mapping types
- UL-SCH and PUSCH processing chains

- Transform precoding and PUSCH mapping types

Day 2 of 2

5G NR Control Channels

- DCI formats and PDCCH processing chain
- Resource element groups and control channel elements
- CORESET structure and characteristics
- PDCCH mapping to CORESETs and search spaces
- UCI formats and PUCCH processing chain
- UCI usage and scheduling requests

5G NR Physical Signals

- DM-RS usage and mapping types
- Signals for channel sounding: CSI-RS and SRS
- PRS and Positioning Support

5G NR Initial Acquisition Procedures

- Synchronization signals: PSS and SSS
- BCH and PBCH processing chains
- Broadcast channel and master information block
- SS block patterns and bursts
- Cell search: PSS and SSS search
- PBCH decoding, including beam sweeping
- RACH

5G NR Waveform Generation and System Simulation Using 5G Toolbox

- Overview of 5G Toolbox
- Interactive and programmatic 5G waveform generation
- Configuration of cluster delay line and tapped delay line wireless channel models
- Signal transmission through a noisy channel
- Receiver implementation, including synchronization and channel estimation
- End-to-end system performance metrics
- Overview of application-specific workflows