



# iBwave CERTIFICATION COURSE SYLLABUS

## LEVEL 3: 5G DESIGN, CAPACITY PLANNING, MIMO

Note: Course syllabus is subject to change

### LEARNING OBJECTIVES

At the end of this certification program, you will be able to:

- ✓ Describe the main features and characteristics of 5G NR networks.
- ✓ Configure systems and small cells for 5G NR networks.
- ✓ Build, analyze and optimize 5G NR designs to achieve required coverage inside buildings.
- ✓ Configure and generate reports required for deeper analysis or proof of compliance.
- ✓ Plan capacity in venues considering the major factors that influence capacity in mobile networks
- ✓ Identify factors influencing MIMO performance

### 5G NEW RADIO FUNDAMENTALS

- ✓ Overview of 5G Requirements
- ✓ 5G Building Blocks
  - Millimeter Wave (mmWave)
  - Sub-6-GHz
  - Flexible Frame Structure
  - Massive MIMO
  - Beamforming
  - Bandwidth Parts and Network Slicing
- ✓ Overview of 5G NR Deployment
  - Non-Standalone Option
  - Standalone Option
  - Next Generation RAN (NG-RAN)
  - 5G NR Core Network

### 5G NEW RADIO TECHNOLOGY

- ✓ Frequency of operation
- ✓ Key Features
  - New Radio (NR) Numerology
  - Bandwidth Partitioning
  - NR Slot formats
- ✓ 5G NR Signals
  - Reference Signals
  - Synchronization Signals
  - Coreset
- ✓ Beamforming in 5G NR
  - Basics of Antennas and Radio Wave Propagation
  - Basic Concepts and Techniques for Beamforming
  - Beamforming Types (Analog, Digital, Hybrid)
  - Antenna Phased Array (Multi Beam Antennas)
  - Beamforming in 5G NR Standard

### CREATING 5G NR PROJECTS USING iBWAIVE DESIGN

- ✓ Setting up 5G NR Wireless Services and Technologies
- ✓ Designing with 5G NR Signal Sources
- ✓ Running 5G NR Predictions
- ✓ Generating 5G NR Reports

### CAPACITY PLANNING (INCLUDES 5G)

#### CAPACITY PLANNING THEORY

- ✓ Capacity background
- ✓ Grade of service / Quality of service
- ✓ User profiles
- ✓ Capacity limits
- ✓ Sample capacity calculations

#### CAPACITY PLANNING IN iBWAIVE DESIGN ENTERPRISE

- ✓ Capacity planning process
- ✓ Capacity definition (template)
- ✓ Market share
- ✓ Usage profile
- ✓ Subscriber service
- ✓ Capacity requirements (project-specific)
- ✓ Requirements
- ✓ Sector limits
- ✓ Capacity zones
- ✓ Capacity map

### MIMO

#### MIMO THEORY

- ✓ MIMO background
- ✓ MIMO operation modes: Diversity vs. Multiplexing
- ✓ Open loop vs. closed loop
- ✓ MIMO gains compared to SISO systems
- ✓ Factors influencing MIMO performance
- ✓ MIMO DAS deployments

#### MIMO IN iBWAIVE DESIGN ENTERPRISE

- ✓ MIMO calculations in iBwave Design
- ✓ Modeling MIMO in iBwave Design
- ✓ Creating a MIMO source
- ✓ MIMO gain configuration
- ✓ Creating and running output maps for MIMO systems

### DESIGN FROM SCRATCH WORKSHOP

Review exercise in class to prepare for final exam

### FINAL EXAM

(3 hours)