



# Overview of OFDM

TRND103d | On-Demand | LTE and VoLTE | ⚙️

Course Duration: 2 hours

Orthogonal Frequency Division Multiplexing (OFDM) is a transmission technique used to achieve very high data rates. OFDM is the technology of choice for all major wireless systems including Wireless LAN – 802.11, WiMAX – 802.16, digital audio/video broadcast systems, and the air interface evolution of 3G Wireless systems based on 3GPP and 3GPP2. OFDM facilitates higher data rates over a wireless medium, which is very exciting to wireless operators who are eager to deploy multimedia rich Internet content over a wireless medium with seamless access anywhere, anytime. This course describes key OFDM concepts and terminology.

## Intended Audience

This is a technical course, primarily intended for those in system design, system integration and test, systems engineering, network engineering, operations, and support.

## Objectives

After completing this course, the student will be able to:

- Walk through the evolution of radio technologies
- Describe the evolution and applications of OFDM
- List the key attributes of OFDM and understand the frequency domain orthogonality
- Define various terms used in OFDM-based systems
- Describe challenges of radio propagation and how OFDM overcome these challenges
- Describe the key operation of cyclic prefix, FFT and IFFT
- List the basic transmitter and receiver components in an OFDM system
- Step through the operations of an end-to-end data transmission in an OFDM-based system

## Course Prerequisites

No Prerequisites

## Outline

1. Introduction
  - 1.1 Evolution of radio technologies
  - 1.2 Concepts of FDMA, TDMA, CDMA
  - 1.3 Need for OFDM for high data rates
2. Principles of OFDM
  - 2.1 Key attributes of OFDM
  - 2.2 Frequency domain orthogonality
  - 2.3 Time and frequency domain views
3. OFDM Basics
  - 3.1 Carrier and subcarrier
  - 3.2 Modulation and OFDM symbol
  - 3.3 Subcarrier spacing
  - 3.4 Guard period and cyclic prefix
4. Radio Propagation
  - 4.1 Multipath and doppler shift
  - 4.2 Inter Symbol Interference (ISI)
  - 4.3 Guard Time
  - 4.4 Inter Carrier Interference (ICI)
  - 4.5 Cyclic prefix and pilots
5. Fourier Transform
  - 5.1 Motivation for using Fourier Transforms in OFDM systems
  - 5.2 Concept of Fourier Transform
  - 5.3 Discrete Fourier Transform (DFT)
  - 5.4 Fast Fourier Transform (FFT)

## 5.5 Implementation

## 6. End-to-End Transmission

- 6.1 Transmitter and receiver components
- 6.2 OFDM operations

## 7. Summary

- 7.1 Put It All Together
- 7.2 Assess the knowledge of the participant based on the objectives of the course