Welcome to MIMO and Beamforming in 5G

5G_105d | On-Demand | 5G Access |
Course Duration: 1.5 hours

This course provides a technical introduction to MIMO and beamforming in 5G. You will learn the role of antennas in wireless communications, the evolution of antenna techniques and the difference between passive and active antenna systems. Additionally, the concepts of MIMO and Massive MIMO will be explained along with the utilization of SU-MIMO and MU-MIMO to increase throughput and capacity, respectively, in wireless systems. Lastly, you will learn the types of beams used in 5G NR and the techniques used to produce them as well as beam management techniques such as beam sweeping, beam selection, beam switching and beam failure recovery so that you are better equipped to configure beamforming parameters and monitor beam performance.

Intended Audience

This course is designed for a broad audience of personnel working in the wireless industry.

Objectives

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

- Describe the types of antenna techniques
- Differentiate between passive and active antennas
- Explain the concept of MIMO
- Explain Massive MIMO and its uses
- Describe SU-MIMO and MU-MIMO
- Describe beamforming
- Differentiate the beamforming techniques
- Explain beam management in 5G systems

Course Prerequisites

No Prerequisites

Outline

1. MIMO Fundamentals
1.1 Transmit and Receive Diversity
1.2 MIMO: What and why?
1.3 Single-User MIMO (SU-MIMO)
1.4 Multi-User MIMO (MU-MIMO)
1.5 DL and UL MIMO in 5G
1.6 Massive MIMO

2. Beamforming
2.1 Beamforming: What and why?
2.2 Analog, digital and hybrid beamforming
2.3 Beamforming in 5G

3. Beamforming in 5G
3.1 Introduction to beam management
3.2 SSB-Block and traffic beams in 5G
3.3 Beam sweeping
3.4 Beam selection
3.5 Beam change
3.6 Beam failure recovery

Putting It All Together