

Mobile Communications (4G)

19 hour technical course

Course Introduction

This online course is aimed at practicing engineers who wish to deepen their knowledge of the fundamental principles of mobile communications and their application in real world networks.

Basic concepts such as signals, systems and noise, as well as the various modulation schemes used in modern mobile networks are covered. Learners will gain an understanding about the wireless propagation environment, modulation, coding and multiple access techniques.

The course focusses on the detailed implementation of two key mobile systems, GSM and UMTS, from the viewpoints of system architecture, the physical layer and system implementation. The Long-Term Evolution (LTE) system is also covered giving learners insight into the ways in which LTE represents an improvement over previous generations.

Course topics

1. Basic Cellular Concepts

- The cellular concept underlying mobile communication systems
- Handover
- Transmitter and receiver architectures
- Performance metrics for cellular systems

2. Engineering Principles Governing the Wireless Propagation Environment

- Path loss
- Multipath propagation
- Fading
- Atmospheric effects

3. Modulation, Coding and Multiple Access Techniques

- The need for modulation, coding and multiple access
- Frequency shift Keying (FSK)/Minimum Shift Keying (MSK)
- Phase Shift Keying (PSK)
- Quadrature Amplitude Modulation (QAM)
- Orthogonal Frequency Shift Keying (OFDM)
- Time Division Multiple Access (TDMA)
- Frequency Division Multiple Access (FDMA)
- Code Division Multiple Access (CDMA)

4. The GSM System: Network Architecture and Operation

- GSM System Architecture
- Physical and logical channels
- GSM radio Interface
- GSM numbering systems
- MO and MT call setup
- GSM security
- GSM roaming

5. Third Generation Systems and UMTS

- Introduction to 3GPP and 3G standardization
- UMTS system architecture and components
- UMTS air interface
- UMTS environment and services

6. Long Term Evolution (4G)

- Market trends in mobile communication and motivation for continued evolution of mobile communications networks
- Air interface evolution/LTE Physical Layer
- LTE System Architecture Evolution (SAE)
- Continued evolution of LTE (LTE Advanced)

Expert multidisciplinary e-courses for engineers at all career stages

Course Units - Mobile Communications (4G)

- Section 1
 - Unit 1: Systems, Signals and Noise
 - Unit 2: Basic Modulation Schemes
 - Unit 3: Higher Modulation Schemes
- Section 2
 - Unit 1: The Basic Radio Channel
 - Unit 2: The Mobile Radio Environment
 - Unit 3: The Cellular Concept
- Section 3
 - Unit 1: Coding
 - Unit 2: Channel Coding
 - Unit 3: Multiple Access
- Section 4
 - Unit 1: GSM Basics
 - Unit 2: GSM Radio Link
 - Unit 3: GSM Network Operation
- Section 5
 - Unit 1: UMTS Basics
 - Unit 2: UMTS Radio Interface
 - Unit 3: UMTS Physical Layer Procedures
- Section 6
 - Unit 1: Long Term Evolution
 - Unit 2: LTE Radio Link
 - Unit 3: Beyond LTE
- Final Assessment



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Who should take this course?

This course is aimed at graduates through to experienced employees working in the telecommunications industry either as engineers, marketing professionals or managers, who are looking to upskill in areas of current and future mobile communications technologies and standards.

Other Engineering Courses

- Power Systems: Network Regulation and Economics
- Power Systems: Renewable Energy Integration
- Power Systems: Protection of Distribution Networks

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