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 focuses 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 Principals 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)

Course content may be subject to change or updates. Please contact the IET for the latest course content.
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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

What makes the IET Academy online courses different?

The IET Academy is developed by the Institution of Engineering and Technology (IET), Europe’s largest professional engineering body, in partnership with leading universities and industry organisations ensuring the highest standard in engineering e-learning.

Tailored for engineers

The e-learning solution is designed to meet companies’ training and development objectives for engineers at all levels: from bridging the skills gaps of new entrants right up to enhancing the multidisciplinary knowledge of experienced engineers.

Cost effective & flexible

For many engineers staying informed of changing technology in order to remain current in their role is paramount; however, finding the time and budget to attend external training is challenging. The IET Academy’s flexible learning platform allows access to training ‘anytime, anywhere’ or the course content can be quickly and easily integrated into your existing learning management system.

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

Further courses are being developed in BIM Management, Engineering Ethics, Entrepreneurship for Engineers, Professionalism, Railway Safety and Risk Management for Engineers.

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.

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