

# Wireless Made Simple

## **Course Duration:**

- 3 - 6 hours.

## **Course Description:**

- This interactive course addresses the needs of non-technical people who need to understand the basic principles of mobile radio for their daily business.
- In that respect, we start with a general description of the wireless channel and a clear definition of mobile operation versus e.g. wireless LAN or fixed wireless.
- The students more or less autonomously work out themselves the underlying network architecture and the general operation of mobile networks.
- The course continues with the presentation of the most important mobile networking standards like GSM, cdma1, UMTS or cdma2000. This part also contains an overview about the different mobile networking generations from 1G to 4G.
- In the next sections we illustrate standard procedures like call setup and handover, always considering the non-technical audience's scope.
- The course also explains the differences between the different multiple access technologies FDMA, TDMA and CDMA and it illustrates the next generation's multiple access technology OFDMA.
- The course ends with an outlook towards the upcoming future of mobile communication, considering the various consequences for the service offerings, for the handset look and feel and the network layout.

## **Pre-Requisites:**

- None.

## **Course Target:**

- After the course the student will be able to describe the fundamentals of mobile radio and its operation.
- The student can state the major standards like GSM or cdma2000 and will be able to line out their differences.
- The student is enabled to judge the major upcoming evolutionary steps in mobile communication like 4G, fixed mobile convergence and "all-IP".

### **Some of your questions that will be answered:**

- How can radio signals traverse the air? How can they contain '0's and '1's?
- What is mobile radio?
- Why are there mobile radio standards and how do they differ?
- How can somebody reach me on my mobile phone wherever I am?
- Which developments can I expect in the future for mobile radio?

### **Who should attend this class ?**

- Everybody who requires basic knowledge about mobile radio for their job.

## Table of Contents:

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### Overview

- **What is Mobile Radio?**
  - ⇒ The Wireless Channel  
Radio Waves and the Electromagnetic Spectrum (Physical Basics, The Electromagnetic Spectrum)
  - ⇒ Embedding Information into a Radio Channel
  - ⇒ Analogy: Using Water Waves to convey Information
  - ⇒ Mobile Radio vs. Fixed Wireless or WLAN
  - ⇒ Comparison: Mobile vs. Fixed Wireless
  - ⇒ Typical WLAN-Operation
- **The Different Players of Mobile Radio**
- **History and Future of Mobile Communication**

### Operation of Mobile Networks

- **Roaming and the Consequences**
  - ⇒ Handover / Handoff
- **Cellular Networking and the related Architecture**
  - ⇒ Mobile Handset Architecture and Layout
- **Use Case Examples**
  - ⇒ When Somebody calls You on Your Cell Phone ...
  - ⇒ This is how the Web is downloaded ...

### Radio Technology Basics

- **Weaknesses of the Radio Channel**
  - ⇒ Attenuation
  - ⇒ Interference with other Users
  - ⇒ Interference with myself
  - ⇒ Eavesdropping
  - ⇒ Consequences
- **Countermeasures**
  - ⇒ Overview

⇒ Backward Error Correction

⇒ Forward Error Correction  
Encryption

- **Multiple Access Technologies**

⇒ Overview and Introduction

⇒ TDMA and FDMA

⇒ CDMA

## Evolution and Future of Mobile Radio

- **Reasons for the Ongoing and Rapid Evolution**

⇒ Commercial Reasons

⇒ Market Driven Reasons

- **Mobile Radio: Comparison between 3G and 4G**

⇒ Performance and Mobility Management related Issues

⇒ Architecture related Issues

⇒ Procedure and Radio related Issues

- **Technical Details of the Evolution**

⇒ Protocol Stack Comparison between 3G and 4G

⇒ Support of various Access Network Technologies