

Course Description

This course provides a detailed scope of modern mobile and cellular network technologies used for second generation, 2G+, 3G and 4G networks. It provides an understanding of the structure and implementation of network technologies and how networks are sized, planned and built.

Students Will Learn

- Describe in detail the structure and function of modern GSM, 2G+ 3G and 4G networks. mobile networks
- Appreciate the design of antenna and air interface subsystems for interfacing with mobile handsets
- Identify signaling, circuit and packet network requirements for core networks
- Size and Plan a mobile network service
- Migrate existing infrastructures using GSM to 2G+ 3G and 4G services
- Implement Mobile services for IP and Internet applications

Target Audience

Mobile Network Planners, Base Station and mobile infrastructure designers, developers for mobile service solutions, Engineers and troubleshooters for mobile carriers.

Course Outline

Module I: The generations of mobile networks

First Generation Analog systems

Second Generation Digital systems

General System Mobile

DECT

TETRA

Enhanced Second Generation (2G+)

Short Message Service

General Packet Radio Service (GPRS)

Wireless Application protocols (WAP)

Lab of WAP showing a Learning Tree Advertisement

Module II: Components of a Modern Service for Cellular Wireless System

Mobile Terminals

Subscriber Identification Modules (SIM)

International Equipment Identification

International Operator Identification

Service Components

BSS, MSC, HLR, VLR, AuC, EIR

Radio Subsystems and the air interface

Physical and logical channels

RF Power Control

Layer 2 Structure and Operation

BCCH Broadcast

Handover

Layer 3 signaling

Base Stations and Cells

Mobile System Controllers

Core Networks

Mobile Intelligent Networks: CAMEL

Value Added Services

Intelligent Network Concepts

Intelligent Network Service Creation

Signaling

Roaming and Billing

User Services

HSCSD

Module III: Universal Mobile Telecommunications Services (UMTS) Architecture

Role of UMTS in 3G

UMTS Services

Core network Interfaces

UMTS Terrestrial Radio Access Network (UTRAN)

User Equipment

Module IV: Air Interface

Principles of Radio

Link Budgets

Physical Propagation Effects

Scattering, Reflection, Diffraction

Channel Modes and Channel Loss

Shadowing

Impacts of Multipath Transmission

Predicting Coverage at VHF, UHF and SHF

Identifying the Characteristics of Antennas

Antenna Structures

Beamforming Antennas

Impacts of Multipath Transmission

Selecting Modulation Techniques

Comparing TDMA and CDMA Performance

Module V: Cell Planning

Using Erlangs and Capacity Measures

Lab of Capacity Calculation on Spreadsheet

Identifying key Radio Transmission and Reception Parameters

Link Budgets and Coverage

Breathing Effects

Hard and Soft Handover

Operating Power Control

Mixing Modes of Traffic

Base Station Subsystems

Module VI: Circuit and Packet Core Network Infrastructures

GSM Core Networks

Defining GPRS Core Network Requirements

Using IP Within the Infrastructure

Evolving UMTS Core Network Interfaces

Addressing elements within the Core

Signaling Interfaces for the Core

Using SDH and ATM for UMTS Core Networks

Module VII: Wireless Microwave for Backhaul

Microwave Link Systems

Dish Antenna Systems

Microwave Link Engineering

Link Design

Capacity and reliability calculation

Module VIII: Sizing Packet Network Services

Calculating Capacity Needs

Circuit Switched Capacity

Packet Switched Capacity

Delay and Queuing

Lab of Sizing a Core Network Service

Module IX: Mobile Terminals and Applications

Functions of a mobile Handset

- Evolution of handsets

- Beyond Voice

- Display and Power limitations

Personal Communications Assistants

- Functions of a PCA

- Potential Configurations

- Example PCA Products

Employing Codecs For Voice

- G.711 vs GSM 6.1 Codecs

BlueTooth

- Overview of Wireless Service

- BlueTooth Classes

- Nets and Piconets

- Master Slave Operation

- Performance

Data Interfaces

- Mobile Broadband Internet Access

Locator Services

- Where Am I

Find Me my Nearest

Mobile Advertising

Module X: Future Wireless Mobile Applications

Near Term

4G and LTE

Mobile Telemetry

Mobile Security Systems

Wireless Trading

Delivery Method

Instructor-Led with numerous Hands-On labs and exercises.

Equipment Requirements

(This apply's to our hands-on courses only)

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

Course Length

3 Days