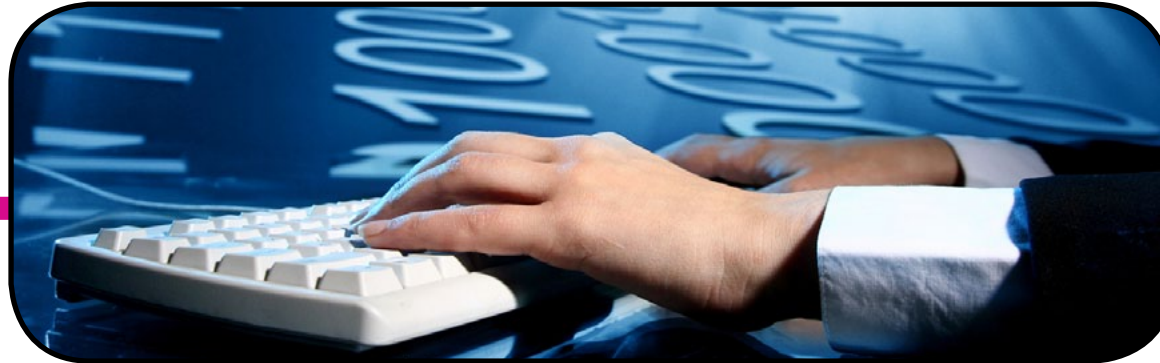




Technology
Programs

Digital Telephony



Duration : 1 Day

Target Group : Telecommunication & Computer Engineers.

**Aim : By the end of the course the trainee should be acquainted with:
Signal transmission principles, design of PCM transmission systems and signalling between exchanges.**

Contents

Digital Transmission

- Explain the principle of Frequency-Division Multiplex (FDM), Time-Division Multiplex (TDM) and Synchronous Transfer Mode (STM)

Principles of PCM Technology

- Basic components of a PCM system
- The individual steps of analog/digital signal conversion
- Band limiting, Sampling & Encoding
- The multiplexing and demultiplexing of binary codes

Digital Transmission Systems

- The design of PCM 30 pulse frame
- Frame Alignment Signal (FAS)
- Digital Transmission Systems of higher capacity
- PCM Links between exchanges

Signalling between Exchanges

- General signalling information
- Signalling via PCM 30 links
- The advantages of the common channel signaling method

Prerequisites : Telecommunication & Computer Engineers.

Technology and Applications of xDSL



Duration : 4 days

Target Group : Telecommunication & Computer Engineers.

Aim : - By the end of the course the trainee should be acquainted with : xDSL Fundamentals, The xDSL Family (HDSL, SHDSL, ADSL).

Contents

Why xDSL?

- The way to xDSL
- Benefits of xDSL

xDSL Fundamentals

- xDSL Architecture
- xDSL Relation with OSI Reference Model

HDSL

- HDSL Functional Model
- Applications over HDSL

SHDSL

- SHDSL System Reference Model
- Applications over SHDSL

Prerequisites : Attending Digital Telephony course.

ADSL

- Operation and Maintenance (OAM)
- Applications over ADSL

V5 Interface Overview



Duration : 2 days

Target Group : Telecommunication Engineers.

Aim : - By the end of the course the trainee should be acquainted with: Features of V5 Interface, Protocol Architecture of V5 interface, PSTN Protocol.

Contents

General Features of V5 Interface

- Access network
- V5 Interface basics
- Objects of the V5 data base

Protocol Architecture of V5 Interface

- Introduction to protocol architecture
- Frame formats

PSTN Protocol

- PSTN Protocol message types
- PSTN Protocol information elements

Prerequisites

Attending Digital Telephony course.

ISDN Overview



Duration : 3 days

Target Group : Telecommunication & Computer Engineers.

Aim : - By the end of the course the trainee should be acquainted with : ISDN principles, DSSSI Protocol & Services.

Contents

Introduction

- Explain the principles of ISDN
- Internetwork interfaces
- Application to ISDN of the 7 layer model

DSSSI Protocol

- Physical layer
- Data link layer
- Network layer

Services

- Basic services (Bearer Services, Teleservices)
- Supplementary services

Prerequisites : Attending Digital Telephony course.

SS7 Overview



Duration : 4 days

Target Group : Telecommunication Engineers.

Aim : - By the end of the course the trainee should be acquainted with: The advantages of common channel signaling, the architecture of SS7, the functions of the MTP and the ISUP.

Contents

Introduction of Signaling

- Explain the differences between common channel signaling and channel associated
- Explain the advantages of common channel signaling
- Name the basic elements in the common channel signaling network

Structure of SS7

- Describe the architecture of SS7
- Describe the 4-level model
- Describe the 7-layer model
- Explain how the 7-layer model is applied to SS7

Message Transfer Part

- Explain the functions of the MTP, signaling link control and message handling
- Describe the structure of the different signal units
- Explain the exchange of signal units
- Explain the network management function

User Parts

- Explain the ISUP

Prerequisites : Attending Digital Telephony course.

PCM30 Basics



Duration : 1 Day

Target Group : Telecommunication Engineers.

Aim : - By the end of the course the trainee should be acquainted with: Fundamentals of PCM, 2Mbit/s Frame, Signaling Pulse Frame including the baseband transmission of the digital signals and block diagram of a primary multiplexer.

Contents

Introduction to PCM

- Advantages of digital transmission

Fundamentals of PCM

- Sampling theorem
- Analog-to-Digital conversion
- Quantizing error

2 Mbit/s Frame and Signaling Pulse Frame

- HDSL Structure of the 2 Mbit/s Frame
- Structure of the Signaling Pulse Frame
- PCM Transmission systems

Baseband Transmission of Digital Signals

- Codirectional Operation Mode
- Contradirectional Operation Mode
- Important PCM interfaces

Block Diagram of a Primary Multiplexer

- Transmit side
- Receive side

Prerequisites

Basic knowledge of Telecommunication.

PDH Basics



Duration : 1 Day

Target Group : Telecommunication Engineers.

Aim : - By the end of the course the trainee should be acquainted with: Digital signal hierarchies, Time-Division Multiplexing of digital signals, Frame structure of 8, 34, 140 Mbit/s hierarchies, Functional description of Multiplexer/ Demultiplexer and Baseband transmission of digital signals.

Contents

Application of Plesiochronous Multiplex Systems

- Digital signal hierarchies
- Connecting options for the digital multiplex systems

Time-Division Multiplexing of Digital Signals

- Basic methods of multiplexing
- Definition of plesiochronous digital signals
- Basic pulse frame structure

Frame Structure of the Digital Signal Hierarchies 2..4

- Frame structure of 8, 34, 140 Mbit/s hierarchies
- Timing sequence of the multiplex process

Functional Description of Multiplexer/ Demultiplexer

- Functional units of the multiplexer & the demultiplexer

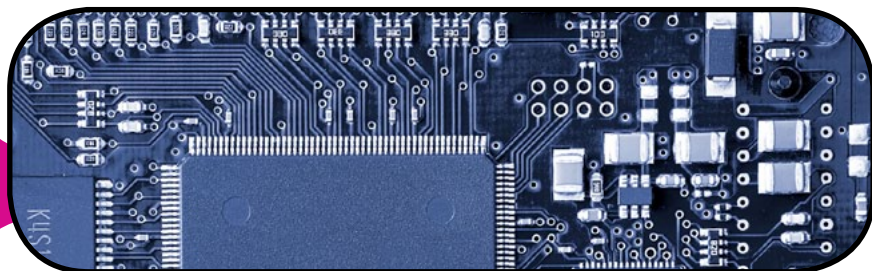
- Supervision and Alarms

Baseband Transmission of Digital Signals

- Interface codes
- Digital signal regeneration
- Reasons for bit errors

Prerequisites : Attending PCM30 Basics course.

SDH Basics



Duration : 2 Days

Target Group : Telecommunication Engineers.

Aim : - By the end of the course the trainee should be acquainted with : PDH Multiplexing, Principles and Characteristics of the SDH, Basic elements of STM-1, Mapping of 140 Mbit/s signal, 34 Mbit/s signal, 2 Mbit/s signal & ATM cells, Pointer functions, Types & Structure, Overhead functions, Monitoring, Maintenance and Control in the SDH.

Contents

- PDH Multiplexing
 - Principles of PDH multiplexing
 - Multiplexing / Demultiplexing of PDH signals
- Principles and Characteristics of the SDH
 - Introduction to the Synchronous Digital Hierarchy SDH
 - Synchronization of STM-1 frames
- Basic Elements of STM-1
 - Elements of an STM-1 signal.
- Mapping
 - Mapping of 140 Mbit/s signal, 34 Mbit/s signal, 2 Mbit/s signal & ATM cells
- Pointer
 - Pointer functions, Types and Structure
 - Pointer addressing scheme
- Pointer justification
- Overhead functions
- Section Overhead (SOH)
- Monitoring, Maintenance and Control in the SDH
 - Alarm interactions overview
 - Bit error monitoring
 - AIS

Prerequisites : Attending PCM30 Basics & PDH Basics courses.

DWDM Basics



Duration : 3 Days

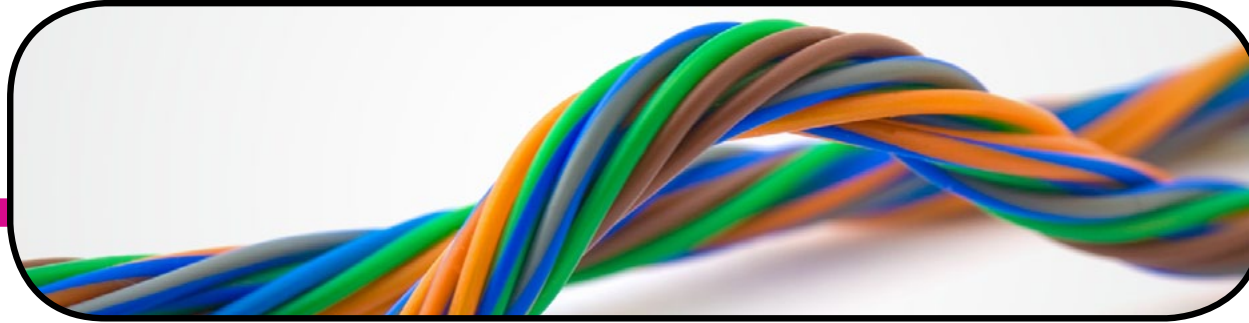
Target Group : Telecommunication Engineers.

Aim : By the end of the course the trainee should be acquainted with : An overview of the technology used in Dense Wavelength Division Multiplexing including Optical Cross-Connect technology principles, Optical basics, Optical network elements, Basics of DWDM link planning & Measurements in DWDM basics.

Contents

- Introduction
 - Basis of DWDM
 - Wavelength plan
 - Basic system applications
- Optical Basics
 - Attenuation, Dispersion & Polarization
 - mode dispersion
 - Nonlinear effects
- Components
 - Filters and Gratings
 - Optical multiplexer and demultiplexer
 - Optical amplifiers, Optical fibers & Dispersion compensation modules
 - Lasers, Modulators & Photodetectors
 - Isolators, Circulators, Connectors & Optical switching units
- Prerequisites : Attending PCM30 Basics, PDH Basics & SDH Basics courses.
- Planning
 - Channel management, Dispersion management & Power management
- Measurements
 - Measurement techniques (Optical Time-Domain Reflectometry, PMD measurements, Optical power measurements & Optical spectrum analysis)

OTH Basics



Duration : 1 Day

Target Group : Telecommunication Engineers.

Aim : - By the end of the course the trainee should be acquainted with : An overview of the structure of a modern optical network, the new transmission standard Optical Transmission Hierarchy OTH, Advantages of the OTN standard, Optical network architecture, Signal structure, Overhead & Maintenance.

Contents

Introduction

- The need for the optical transport hierarchy/optical transport network
- Advantages of the OTN standard

Optical network architecture

- Functional architecture
- Network structure & Network topologies

Signal structure

- Overheads
- Signal types (Terminology, Optical channel structure & Optical transport structure)
- Mapping (OPUk container, ODUk container, OTUk container & OCh payload container)
- Insertion of client signals
- Multiplexing

Overhead

- OUT,ODU and OPU Overhead
- OOS/OSC Overhead (OTS overhead, OMS overhead & OCh overhead)

Maintenance

- Maintenance signals (OSC maintenance signals & OCh payload maintenance signals)

Prerequisites

Attending PCM30 Basics, PDH Basics, SDH Basics & DWDM Basics courses.

GSM Introduction



Duration : 5 Days

Target Group : Telecommunication Engineers

Aim : Overview on the GSM transmission principle, network architecture, protocols & procedures, radio interface.

Contents

Introduction

- History
- GSM
- Current situation, market & trends

Transmission Principles

- GSM network structure
- Duplex transmission & multiple access
- GSM – Fixed network transmission
- GSM Air interface

GSM PLMN

- Overview
- Network elements

Prerequisites :

Basic knowledge of telecommunication.

Procedures

- Codes & Identities
- GSM Security features
- Location update
- Call setup/ Call handling

Radio Interface

- Physics of layer 1
- Logic of LI
- MOC / MTC

CDMA



Duration : 5 Days

Target Group : Telecommunication Engineers.

Aim : Overview on the CDMA principle & network architecture air interface.

Contents

The way to CDMA Technology

- Advantage of digital communications
- Cellular system architecture and components
- Wireless digital transmission problems and its solutions
- Transmission principles

Basic concept of spread spectrum

- Advantage of CDMA
- Spread Spectrum technology
- CDMA codes and its usage
- Iterium Standard-95 System.
- Pseduo Random Noise Sequence.

Prerequisites : Attending GSM Introduction course or equivalent knowledge.

CDMA Air interface overview

- CDMA air links and channels
- #### CDMA system aspects
- Power control in CDMA
 - Rake receiver
 - Handoff versus handover
 - Multiuser detection
- #### Practical survey

GPRS Introduction



Duration : 2 Days

Target Group : Telecommunication engineers.

Aim : Knowledge of the GPRS principles, advantages, network, procedures, radio transmission and EDGE.

Contents

Introduction and overview

- Mobile radio evolution
- GSM – Current situation, services & applications
- GSM – Phase2+

GPRS - General Packet Radio Services

- Basic principles
- GPRS-Architecture
- Logical functions

GPRS Radio Interface

- The Radio interface
- Channel bundling, sharing of channels
- Coding schemes

Logical GPRS radio channels

Procedures

- Activation of GPRS services
- GPRS Identities
- Mobility management states
- Packet Data Protocol (PDP) states
- GPRS Packet data transmission

Prerequisites : Attending GSM Introduction course.

UMTS Introduction



Duration : 4 Days

Target Group : Telecommunication Engineers.

Aim : - By the end of the course the trainee should be acquainted with : Overview on Standardization, Basic evolution, Service, Security, Transport concept, Network architecture & principles of the UMTS WCDMA radio transmission (UTRA).

Contents

The Third Generation (3G)

- IMT-2000
- UMTS

UMTS Evolution

- Background & Principles

The UMTS Network

- Release '99 network overview
- Rel 4 & Rel 5

Security Features

- IMEI Check
- (P-)TMSI Allocation

- Authentication
- Ciphering & Integrity check
- UTRA Aspects
- Power control
- Rake receiver
- Handover

UMTS Radio Access: Basic Principles

- UTRA: The UMTS Terrestrial Radio Access
- MC-CDMA / UTRA / TD-SCDMA Comparison

Prerequisites :

Attending GPRS Introduction & GSM Introduction courses.

GPRS/UMTS CN PS Introduction and system architecture



Duration : 2 Days

Target Group : Telecommunication engineers.

Aim : - Overview on basic technology and structure of the UMTS and GPRS, name the different network entities and their inter working.

Content

GPRS and UMTS network

- 2G and 3G system
- Standardization
- Network topology packet and circuit switching

GPRS and UMTS Access Network Technology

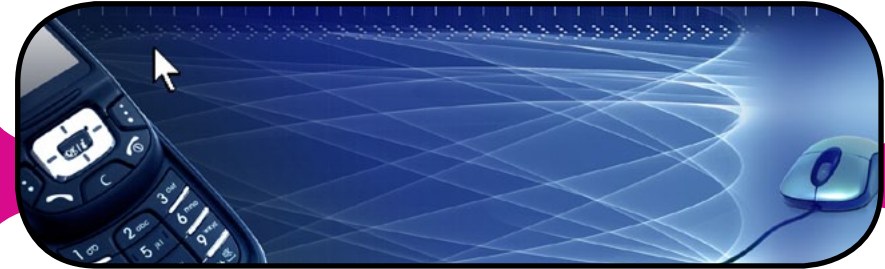
- Transmission and multiplexing principles
- Spreading scrambling in UMTS
- Packet transmission in GPRS

UMTS and GPRS Core Network Technology

- UMTS and GPRS network interfaces
- Packet switching principles in core network

Prerequisites : Attending GSM Introduction course.

Introduction to IP Multimedia Subsystem (IMS)



Duration : 3 Days

Target Group : Telecommunication Engineers.

Aim : Overview on basic knowledge of the IP-Multimedia Subsystem (IMS) standardization, basic evolution and control protocols.

Contents

Introduction to IP Multimedia System

- Internet telephony basics
- Horizontally layered networks
- Internet multimedia protocol stack
- The internet and its impact on mobile communications

IMS Session control and Subscription

- Session initiation and Session description protocol
- Home Subscriber Service (HSS)
- IMS Session control signalling examples
- IM Service Concept
- Interworking, Media conversion and Manipulation
- Media gateway
- Media gateway control function

Prerequisites : Attending GSM Introduction, UMTS Introduction and GPRS Introduction courses.

WLAN Basics



Duration : 2 Days

Target Group : Telecommunication & Computer Engineers.

Aim : - By the end of the course the trainee should be acquainted with: Fundamental properties of WLAN, Basic WLAN configurations, WLAN Standardization, physical & MAC Layer and security basics.

Contents

Introduction to WLAN

- Fundamental properties of WLAN
- Examples of WLAN applications

WLAN Architecture

- Basic WLAN configurations

WLAN Standardization

- IEEE 802.11
- Alternative standards

Physical and MAC Layer

- OSI reference model

- Physical layer

- MAC layer

Security Basics

- Basic principles (Authentication, Availability, Authorization)

- Wired Equivalent Privacy (WEP)

Practical Lab

Prerequisites : Attending mobile & data courses.

WiMAX



Duration: 3 Days

Target Group : Telecommunication & computer engineers.

Aim : - By the end of the course the trainee should be acquainted with :

Complete knowledge of what is WiMAX technology, WiMAX standards and development phases, how to build a WiMAX network, differences between WiFi and WiMAX, introduction to WiMAX protocol stack, what is the scenario to attach a WiMAX network and sample application of WiMAX in Egypt.

Contents

- Introduction to WiMAX
- WiMAX phases
- WiMAX forum
- WiMAX network architecture
- WiMAX vs. WiFi
- WiMAX Layers
- WiMAX network entry
- WiMAX topologies
- WiMAX applications

Prerequisites : Attending mobile courses.

NGN



Duration : 5 Days

Target Group : Telecommunication Engineers.

Aim : The participant will be able to

- Identify the challenges associated with migration and wide deployment of NGN services.
- Define the transport and signalling protocols.
- Describe the major components of the NGN network.
- Describe a typical network architecture.
- Identify different available services and applications.

Contents

Introduction to NGN

- What is NGN?
- Why NGN?
- Fundamental characteristics of NGN.

NGN Architecture

- NGN Components.
- NGN Layers.

Evolution to NGN

- Migration from TDM to NGN.

NGN Features & Services

- Advantages of NGN.

Quality of Service

- What is QoS?
- How can QoS be applied?

NGN Protocols

- H.323, Q.931, H.245, MGCP, H.248/ Megaco, SIP, SIGTRAN & PARLAY/ JAIN.

Security features required in NGN

- Security Requirements.
- Threat Analysis in NGN.

Site visit

Prerequisites : Basic knowledge of Telecommunication.

NGN over xDSL



Duration : 4 Days

Target Group : Telecommunication & Computer Engineers.

Aim : The participant will be able to

- The different types of internet connection.
- The xDSL architecture, types & xDSL obstacles.
- The method of transferring audio and television signal on the data transmission network.
- The NGN network architecture.

Contents

Different ways for internet connection

- Shared analog and digital transmission.
- Differences between ADSL and leased line access.

Why xDSL?

- What is DSL & why do people use it?
- xDSL architecture & family
- Types of xDSL.
- Echo canceller.

Voice and video over IP over xDSL

- Voice over xDSL.

- Network topologies for VODSL.

- Deploying TV Over IP.

- TV over IP using ADSL and VDSL

NGN Overview

- Network Convergence.
- NGN Network architecture.

Prerequisites :

Basic knowledge of Telecommunication.

LTE (Long-Term Evolution)



Duration : 5 Days

Target Group : Telecommunication engineers.

Aim : By the end of the course the trainee should be acquainted with:

- Overview of OFDM or Orthogonal Frequency Division Multiplexing.
- Description of the most important technologies used by LTE to support the requirements, including transmission schemes, scheduling, multi-antenna support, and spectrum flexibility.
- Overview of some of the most important components and features of LTE.
- Description of the LTE radio-interface architecture with an overview of the functions and characteristics of the different protocol layers.
- Overview of the System Architecture Evolution (SAE) work in 3GPP.

Contents

- OFDM Transmission
- Wider-band 'single-carrier' Transmission
- Multi Antenna Techniques
- Scheduling, Link adaptation and Hybrid ARQ
- LTE and SAE: Introduction and Design targets
- LTE Radio Access
- LTE Radio Interface Architecture
- LTE Physical Layer
- LTE Access Procedures
- System Architecture Evolution

Prerequisites : Attending UMTS & IMS courses.