

## MEA: Telephony systems

### Online course specification

#### Target audience:

This PTT online course is aimed at those involved in the maintenance of telephony systems.

#### Course aim:

This course provides an introduction to the principles and operation of circuit-switched telephony systems. The course also covers subjects, such as teletraffic engineering and signalling, that are not only relevant to conventional telephone networks but also Voice over IP (VoIP) services.

#### Course level: Intermediate

*An explanation of PTT course levels is given at the end of this document*

#### Pre-requisites:

You will get the most out of this course if you already have an appreciation of the facilities provided by modern telecommunications systems.

It is recommended that the PTT e-learning course "Telecoms networks and services" is studied before attempting this "Telephony systems" course.

#### Course structure:

The course consists of the following 7 modules:

1. Course introduction
2. Introduction to the PSTN
3. Signalling principles
4. The access network
5. Inter-exchange signalling
6. The Intelligent Network
7. Teletraffic engineering

#### Module 1: Course introduction

Module aim: To summarise the aims of each module and introduce the navigation and learning facilities provided by the course.

#### Module 2: Introduction to the PSTN

Module aim: Describe the components, structure and basic operation of the public switched telephone network (PSTN).

After completing this module, a trainee will be able to:

- describe the role of the functional components of the PSTN including transmission links, exchanges and signalling links.
- describe the role of the basic components of a telephone exchange.
- describe the hierarchical structure of a telephone network
- discuss the structure and allocation of numbering in a PSTN.

- describe the sequence of events that occur during the setting up a call over the PSTN for both a conventional call and for a special services call with reference to the key signalling messages.

### **Module 3: Signalling principles**

Module aim: Describe the role and main types of signalling systems.

After completing this module, a trainee will be able to:

- explain the functions of signalling including setting up and releasing transmission resources, sending address information and capability negotiation.
- explain the concepts of Channel Associated Signalling (CAS) and Common Channel Signalling (CCS).
- describe the role of the various signalling conditions on the local loop including the "off-hook" condition and audio information signals.
- describe the setting and release of speech channels for a call with reference to the role of the local loop and inter-exchange signalling messages.

### **Module 4: The access network**

Module aim: Describe the structure of a PSTN local access network and the types of signalling used in the access network.

After completing this module, a trainee will be able to:

- describe the role of a Primary Flexibility Point (PFP) and drop point (DP) in a copper-based access network.
- describe the role of optical fibre in access networks with reference to RLU's, FTTC and FTTP.
- describe the types of Channel Associated Signalling used over the local loop including loop/disconnect and DTMF.
- describe how a telephone generates signalling conditions.
- list and explain the role of the various information audio tones including dialing tone, busy tone and ringing tone.
- describe the role of, and methods of providing, a Calling Line Identity (CLI) service.

### **Module 5: Inter-exchange signalling**

Module aim: Discuss the role and operation of signalling systems within switched telephone networks.

After completing this module, a trainee will be able to:

- describe the benefits of the use of Common Channel Signalling (CCS) between exchanges.
- list the types of CCS used in the PSTN, ISDN, mobile networks and private networks giving an indication of their capabilities and typical applications.
- explain the role of the various types of signalling point in a signalling network.
- describe the structure of a CCS system with reference to the provision of path diversity.
- describe the role of, and relationship between, the various protocols used by the common channel signalling system number 7 (C7) with reference to the OSI reference model (OSIRM).
- explain the role of the various ISUP signalling messages involved in call set-up including the IAM and ACM messages.

## **Module 6: The Intelligent Network**

Module aim: Describe the role, facilities and operation of an Intelligent Network.

After completing this module, a trainee will be able to:

- describe the services provided by the Intelligent Network (IN).
- explain the role of, and interaction between, C7 signalling protocols in the IN including ISDN User Part (ISUP) and IN Application Part (INAP).
- explain how supplementary services such as call forwarding are provided.
- describe the role of a Service Control Point (SCP).
- explain the number translation procedure for non-geographic numbers.

## **Module 7: Teletraffic engineering**

Module aim: To discuss the objectives of teletraffic engineering and the parameters used in assessing the service offered by a telephony system.

After completing this module, a trainee will be able to:

- define the Grade of Service of a telephony service in terms of blocking probability.
- define the Erlang unit of traffic load.
- explain the relationship between blocking probability and the number of available circuits.
- explain that there are formulae available to determine the number of circuits required to ensure a particular grade of service for an expected traffic load.
- compare the role of, assumptions made by, and applications of the Erlang B and Erlang C formulae.
- define Availability in relation to the reliability of a telephony system.
- define Post Dial Delay and explain its relevance.

**Course access requirements:**

To access the course, a computer running a browser such as Google Chrome, Safari etc is required. The computer should have Internet access. A screen resolution of at least 1024x768 is necessary.

**Learning facilities:**

This online course employs interactive simulations, hypertext links to an online glossary and multiple-choice question sessions to fully involve the trainee in the learning experience. Each module provides revision links to previously studied, relevant topics. A record of progress and level of achievement is recorded for each trainee. Once studied as a structured, assessed course, the content can be browsed for revision or reference.

**PTT course levels:**

PTT online courses are categorised by one of three levels according to the depth of treatment they provide:

**1. Introductory:**

PTT Introductory courses are designed for those with no previous experience or knowledge of telecommunications. These courses provide an overview of telecommunications or discuss the fundamentals of electronic communications. The study of general science at secondary (high) school is a typical pre-requisite for PTT Introductory courses.

PTT Introductory courses are suitable for those joining the telecommunications sector particularly those in an apprenticeship programme.

**2. Intermediate:**

PTT Intermediate courses are designed for technicians and engineers requiring an understanding of a certain aspect of telecommunications. Those planning to study an Intermediate course should have an understanding of the basic principles of electronic communications.

The depth of treatment provided by Intermediate courses is typically equivalent to level 3 of a UK national vocational qualification (NVQ). PTT Intermediate courses can be used to support the attainment of a Communications Technology NVQ at level 3.

**3. Advanced:**

PTT Advanced courses are designed for those who require an in-depth treatment of a certain aspect of telecommunications. Such courses are suitable for system designers as well as those who will be responsible for the maintenance of the system described in the course.

Those planning to study a PTT Advanced course should have a background in telecommunications, and an understanding of telecommunications fundamentals and the principles of the type of telecommunications system described in the course.