

## **PAG: Telecommunications networks**

### **Online course specification**

#### **Target audience:**

This course is designed for those who require an introduction to the fundamental technical concepts that underpin modern telecommunications. The course is suitable for those joining the industry in a technical role especially those in an apprenticeship.

#### **Course aim:**

Provides an overview of the role, structure, principles of operation, and capabilities of modern telecommunications networks.

#### **Course level:** Introductory

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

#### **Pre-requisites:**

An understanding of the principles of digital transmission. It is recommended that the PTT courses “Transmission fundamentals”, “Modulation and multiplexing”, and “Data communications principles” are studied before attempting this course.

#### **Course structure:**

The course consists of the following 5 modules:

1. Providing connections
2. Transmission links
3. Transmission networks
4. Public telephony networks
5. Access networks

#### **Module 1:** Providing connections

Module aim: To introduce the ways in which modern telecommunications networks provide connections for telecoms services and the standards that allow international operation.

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

- explain that telecommunications networks provide long distance connections for various types of telecommunications services.
- compare the features and roles of permanent and switched connections.
- explain that a connection should provide enough bandwidth for the service using that connection as well as a low error rate and minimum delay.
- describe the role and relationship between transmission lines, network links and circuits.
- compare the features and benefits of connection-oriented and connectionless operation of networks.
- describe the concept, operation, and applications of virtual circuits.

## **Module 2: Transmission links**

Module aim: To describe the features, capabilities and applications of wired and wireless transmission links.

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

- describe the functions of the basic components of an optical link including OLTE and repeaters.
- describe the capabilities and applications of optical links.
- describe the role of the main components of a submarine optical cable system.
- describe the features of examples of submarine cable systems in terms of total capacity, countries served, repeater spacing and system length.
- describe applications and features of point to point microwave links.
- describe and compare the features, facilities and applications of geostationary orbit and low earth orbit satellite systems.
- describe the functions of the main components and capabilities of point to point satellite links.
- give examples of applications of satellite systems.
- describe the role of the various telecoms standards bodies.

## **Module 3: Transmission networks**

Module aim: To compare the capabilities, facilities, structure and operation of TDM and next generation transmission networks.

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

- explain that telecommunications networks must be reliable, resilient, secure and have enough resources to provide the required quality of service at the busiest periods.
- describe and compare the typical topologies and roles of core, metropolitan and access networks.
- describe the role and features of a network conforming to the synchronous digital hierarchy
- describe the role of various types of TDM switching equipment inc terminal mux, cross-connects and drop and insert with reference to electronic and optical switching.
- explain the role of automatic protection systems.
- describe the role of a network management system.
- describe and compare the role of the transport, control and service (session and application) layers of a next generation network (NGN).
- describe the structure and role of the main components of an NGN.

## **Module 4: Public telephony networks**

Module aim: To describe the structure, features, and role of the elements, of networks that provide public telephony services.

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

- describe the capabilities, functional components and facilities of systems that provide fixed line national and international telephone services.
- describe the structure of a mobile system in terms of the radio access network and core network.
- describe the role of the various databases employed in a mobile network.
- compare the structure of the various generations of mobile networks.
- explain the advantages of providing voice and data services over the same next generation network.

- describe the role of the components of a system that delivers a public telephony service over a next generation network.
- explain the benefits of the provision of Voice over IP (VoIP) fixed line telephony over broadband connections for both customers and service providers.

#### **Module 5: Access networks**

Module aim: To describe the features, capabilities and role of the components of the networks that connect residential and business customers to telecommunications services.

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

- describe the structure of a local access network with reference to the role of the main distribution frame, primary cross-connect points, street cabinets, multipair cables and distribution points.
- explain that the speeds possible with broadband services delivered over copper wires are dependent on the length of the line.
- Compare the reach, maximum data transfer rates and applications of ADSL, VDSL and g.fast digital subscriber line broadband services.
- compare the structure and relative advantages of fibre to the cabinet (FTTC) and fibre to the home (FTTH) systems.
- describe the basic functions of the main components of a hybrid fibre coax (HFC) system and describe its capabilities regarding broadband access to online services.
- compare methods of delivering high speed communications for businesses.
- describe the advantages of the use of wireless communications in remote areas with reference to VSAT satellite services and fixed wireless access (FWA) broadband provision.
- explain the factors that determine the broadband speeds possible over a mobile system's radio access network.

**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.

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