

## **WAA: Wireless communications**

### **Online course specification**

#### **Target audience:**

This course is designed for those who require an appreciation of wireless communications including those joining the telecoms sector in a managerial or technical role.

#### **Course aim:**

To introduce the basic operation, capabilities and applications of wireless communications.

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

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

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

This course does not assume any prior knowledge of telecommunications.

#### **Course structure:**

The course consists of the following 3 modules:

1. Introduction to wireless
2. Fixed and nomadic wireless communications
3. Mobile services

#### **Module 1:** Introduction to wireless

Module aim: To introduce the different types of wireless communication, the factors that affect the capabilities of services using wireless communications and the need for control of the use of the radio spectrum.

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

- compare the characteristics and applications of point to point, point to multipoint, nomadic, and mobile communications.
- describe the relationship between the bandwidth occupied by a radio signal and the information transfer capability of that signal.
- describe and compare co-channel interference and adjacent channel interference.
- describe the various factors that affect the received power level of a radio signal.
- explain the significance of the carrier to noise ratio.
- describe the factors that affect the choice of radio frequency for a particular application.
- explain how microwave signals used for mobile communications are affected by buildings and other obstructions.
- explain the role of the ITU and national regulators in the allocation of radio frequency bands for particular applications.
- give examples of the use of the various radio bands.

## **Module 2:** Fixed and nomadic wireless communications

Module aim: To introduce the principles, capabilities and applications of wireless systems which provide communications between fixed points or to nomadic devices within an area.

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

- describe the applications and role of the components of fixed microwave radio links.
- describe the characteristics and applications of the services provided by geostationary and low earth orbit satellites.
- explain that several unlicensed radio channels in two radio bands have been allocated to WiFi communications.
- explain the principles of operation of WiFi communications with reference to how WiFi stations share a radio channel.
- describe the techniques used to ensure the security of wireless communications.
- explain how “man in the middle” attacks can compromise the security of WiFi and mobile communications and how the threat of such attacks can be minimised.
- compare the capabilities of the various generation of WiFi in terms of data transfer speeds, range and security.
- describe the capabilities and applications of, and means of providing, fixed wireless access (FWA) to online services.

## **Module 3:** Mobile services

Module aim: To introduce the operation and capabilities of the systems that provide mobile communications.

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

- explain that modern mobile systems offer telephony, messaging, data and location-based services, and give applications of each.
- explain that a mobile system must authenticate users, track user equipment location, manage handover, provide connections to services, and collect usage data.
- describe the role of the key functions of the radio access network and core network of a mobile system.
- explain what is meant by handover, the reasons for handover, and the basic procedures involved in handover.
- describe what is meant by roaming as applied to mobile communications with reference to the commercial and administrative aspects, and the role of eSIMs.
- explain that achievable data transfer rates depend on the number of active mobile users in an area and the carrier to noise ratio.
- describe how mobile systems have evolved through various generations with each offering improvements in service offerings.
- describe the applications and capabilities of alternative (non 3GPP) mobile systems including those providing communications for the emergency services and railways.
- describe the basic security measures taken to protect mobile systems from unauthorised access and to prevent the interception of transmitted information.

**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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