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learntelecoms interactive e-learning suite of courses from PTT:
Introduction to telecommunications

StarTel

- is a suite of interactive, online courses which provides an introduction to the technical, service and commercial aspects of modern telecommunications.
- consists of five separate but integrated courses:

  1: Analogue and digital signals
  2: Transmission fundamentals
  3: Data communication principles
  4: Telecoms networks and services
  5: Media encoding and transmission

Training delivery:

To access the course, a PC running a browser such as Internet Explorer 6 or above, Firefox 2 or above, Google Chrome or Safari is required. The PC should have Internet access and be running Flash version 8 or above. A screen resolution of at least 1024x768 is necessary.

StarTel courses:

- support the achievement of a Telecommunications or Communications Technology NVQ at level 3.
- employ interactive simulations, hypertext links and question sessions to fully involve the trainee in the learning experience.
- provide personalised training with each trainee able to make his/her on notes and place bookmarks. A record of progress and level of achievement is recorded for each trainee.
- provide a structured assessed course and can also be used to browse for revision or reference.

Target audience:

The StarTel suite of courses have been designed for those who:

- are studying in preparation for a career in the telecoms or ICT sector.
- have recently joined the telecoms sector perhaps in an apprenticeship scheme.
- are in the telecoms or ICT sector and want to develop their knowledge of modern networks and services.

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learntelecoms StarTel suite of e-learning courses
Course SRA: Analogue and digital signals

Pre-requisite:

Secondary (high) school education in Physics and/or general electronics/electrical engineering background.

In the UK, appropriate pre-requisite qualifications are General Certificate of Secondary Education (GCSE) in Physics or Additional Science

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Course Aim:

After completing this course a trainee will be able to describe the characteristics and capabilities of the signals used in communications systems and the impairments that limit communications.

Summary of topics covered:

Basic principles and characteristics of the passive components of an electrical circuit.

Characteristics of analogue signals; explanation of the terms level, frequency and bandwidth.

Role and characteristics of transformers with reference to turns ratio and efficiency.

Meaning and significance of the root mean square (rms) power of a waveform.

Expressing loss in decibel units; explanation of the advantages of using decibel units.

Characteristics of AC circuits containing inductance and capacitance; concepts of impedance and resonant frequency.

Causes and effects of analogue impairments including loss, delay, noise, distortion, echo and crosstalk.

Definition and significance of signal to noise ratio.

Advantages of digital signals; explanations of bits, bytes and bit rate.

Relationship between the bandwidth of a link and the maximum achievable bit rate.

Causes of digital errors including noise, jitter and dispersion; expression of bit error rate; concept of noise margin.

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Course SRB: Transmission fundamentals

Pre-requisite:

An understanding of the basic properties of analogue and digital signals and passive electronic components. It is recommended that the PTT course SRA: “Analogue and digital signals” is studied before attempting this course.

Course Aim:

After completing this course a trainee will be able to describe the characteristics, capabilities and applications of copper, optical fibre and wireless transmission media and explain the techniques used to maximise the traffic carrying capacity of those media.

Summary of topics covered:

Conditions for maximum power transfer over a copper cable with reference to its characteristic impedance.

Use of logarithmic units to express power loss and level with reference to dB and dBm.

Comparison of the characteristics and applications of twisted pair and coaxial copper cable.

Principles of the transmission of information over optical fibres.

Characteristics and applications of transmissions in the various frequency bands of the electro-magnetic spectrum from low frequency (LF) band to near infrared (NIR) band.

Principles, capabilities and applications of various types of modulation technique including AM, FSK, PSK, QAM and GMSK.

Principles of Time Division Multiplexing (TDM) and capabilities of TDM signals as used in modern telecommunications networks.

Role, characteristics and format of the various types of signal transmitted over copper cable systems including Manchester encoding, CMI, AMI, HDB3 and 2B1Q.

Explain the basic principles of block coding with reference to error checking, bandwidth requirement and use with optical signals.

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Course SRC: Data communication principles

Pre-requisite:

An understanding of the basic properties of digital signals. It is recommended that the PTT course SRA: “Analogue and digital signals” is studied before attempting this course.

Course Aim:

After completing this course a trainee will be able to explain the fundamental principles of data communications and describe the role of the basic functional components of data links and the protocols that define their operation.

Summary of topics covered:

Role and operation of the various components of a digital link.

Role of an interface between communications sub-systems in terms of the transfer of control

signals and data.

Comparison of the characteristics of serial and parallel interfaces giving examples of common types of interface.

Comparison of the operation of synchronous and asynchronous links.

Describe the role of a clock signal on a synchronous link and describe how timing information can be distributed.

Comparison of the basic properties of simplex, duplex and half duplex communication links.

Principles and advantages of packet switching with reference to the role of packets and frames.

Basic principles of the connectionless operation of the Internet.

Concepts and causes of congestion and congestion collapse; methods of avoiding congestion.

Role and facilities of data protocols and their categorisation with reference to the OSI Reference Model and to the Internet suite of protocols.

Basic principles of Carrier Sense Multiple Access (CSMA) with reference to its use in Ethernet

Local Area Networks

Role and basic structure of local and wide area networks; role of the functional components of these networks including hub, switch, router, gateway and server.

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Course SRD: Telecommunications networks and services

Pre-requisite:
General secondary school education

Course Aim:

This course provides an overview of the role, structure and capabilities of modern telecommunications networks, the regulatory and commercial aspects of service provision, and the facilities of telecommunication services offered to residential and business customers.

Summary of topics covered:

Basic infrastructure and services provided by telecommunications networks.

The role of the various telecoms standards and regulatory bodies.

Features, capabilities and components of copper and optical fibre based transmission links.

Applications and capabilities of various types of radio link used in modern telecommunications networks.

Capabilities, functional components and facilities of systems that provide fixed line national and international telephone services.

Capabilities of the various generations of mobile communications systems in terms of the services and facilities they provide.

Technical and commercial issues relating to mobile service delivery.

Philosophy behind the Internet, its infrastructure and basic operation, and the role of the various organisations that administer and operate the Internet.

Capabilities of modern data services, the role of service level agreements and the different ways of accessing communications services.

Role, structure, components, and capabilities of a national transmission network.

Advantages of a next generation network that use the Internet protocol.

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Course SRE: Media encoding and transmission

Pre-requisite:

An understanding of the fundamentals of analogue and digital signals and a basic understanding of digital communications and the role of data protocols.
Study of the StarTel courses SRA “Analogue and digital signals” and SRC “Data communication principles” is recommended before attempting this “Media encoding and transmission” course.

Course Aim:

After completing this course a trainee will be able to describe the encoding, compression and transmission of voice and video over telecommunications networks.

The topics covered by this course are:

A/D conversion: Principles of PCM, cause and effects of quantisation distortion and aliasing, benefits of non-linear (A-law and μ-law) encoding, factors that determine the bit rate of an encoded signal.

Basic telephony: Role of the components of a telephone and a residential telephone installation; reasons for the restriction of speech bandwidth, the role of the functional elements of a call connection in a circuit-switched telephone network including hybrids, amplifiers and codecs; minimising echo.

Speech and Music: Bandwidth requirements of different types of audio traffic; reducing data transfer requirements by removing redundant information (compression); role and applications of differential, psycho-acoustic and sub-band compression techniques; basic principles and applications of hybrid vocoding; role of compression in IP telephony, mobile telephony, digital radio and music streaming services; comparison of the characteristics and applications of various codecs.

Video: Bit rate and delay requirements of video traffic; factors that affect the required bit rate for the transmission of video and methods of minimising the required bit rate; comparison of compression techniques inc. H.261, JPEG, and MPEG; basic principles of MPEG encoding; comparison of the characteristics and applications of various codecs in video telephony and conferencing, television broadcasting, and video streaming services.

Voice transport: Basic components of a public switched telephone network (PSTN) and a Voice over IP (VoIP) system; basic role of signalling in both types of telephony system; characteristics and benefits of a PSTN compared to those of a VoIP system; techniques used to overcome the limitations of a packet switched telephone network.