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learntelecoms interactive e-learning suite of courses from PTT:
StarTel v4 Introduction to telecommunications

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- is a suite of interactive, e-learning courses designed to run under Windows™ XP or 7.
- provides an introduction to the technical and service aspects of modern telecommunications.
- consists of six separate but integrated courses:

1: Analogue and digital signals
2: Transmission fundamentals
3: Data communication principles
4: Principles of voice processing and transmission
5: Telecoms networks
6: Telecoms services

Training delivery:

study on-line.

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 SLB: Principles of voice processing and transmission

Pre-requisite:

Understanding of the characteristics of analogue and digital signals and the impairments that affect those signals. Also an understanding of the basic principles of packet switching and time dividion multiplexing.
Study of the StarTel courses SRA “Analogue and digital signals”, SRB “Transmission fundamentals and SRC “Data communication principles” is recommended.

Course Aim:

After completing this course a trainee will be able to describe the signal processing required to provide a telephony service over circuit-switched and packet-switched networks and describe video compression techniques.

The topics covered by this course are:

A/D conversion: Principles of PCM, A-law and μ-law compression; cause and effects of quantisation distortion; comparison of the quality of the different encoding techniques.

Basic telephony: Components of a telephone; function of hybrids; minimising echo; restriction of speech bandwidth; relative measurements (dBr, dBmO).

Speech and Music: Bandwidth requirements of different types of audio traffic; principles of ADPCM and hybrid vocoders; sub-band encoding; relevance of QD units; demonstrations of the quality of ADPCM, sub-band encoding and vocoders.

Video: bit rate and delay requirements of video traffic; compression techniques inc. H.261, JPEG, and MPEG.

Voice transport: Introduction to the role of exchanges and signalling in setting up a voice call over a circuit-switched network; extra signal processing required for a “Voice over IP” (VoIP) call; introduction to the system components involved in an Internet telephony (VoIP) call.

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Course SLC: Telecommunications networks

Pre-requisite:

Understanding of the subjects covered in the previous StarTel courses SRA, SRB, SRC and SLB.

Course Aim:

After completing this course a trainee will be able to describe the basic components, operation and features of modern telecommunications networks.

The topics covered by this course are:

Line transmission: Balanced and unbalanced pairs; basic structure and capabilities of coaxial cable and optical fibre cable; structure of the local access network of a PSTN; basic components of a submarine cable system.

Radio transmission: Basic components of a fixed microwave link, a mobile radio link and satellite systems.

Switching: Principles of space and time switching as used in circuitswitched networks; basic components of a telephone exchange inc. the switching matrix.

Types of connection: Capabilities and applications of leased lines, circuit switched connections and packet-switched virtual circuits. Principles of connectionless (Internet) operation.

Transmission networks: The basic components of networks based on the PDH and the SDH; benefits of SDH networks versus PDH; comparison between SDH and SONET.

Circuit switched networks: The switching hierarchy; role and operation of intelligent networks; numbering issues; introduction to teletraffic engineering.

Packet switched networks: Basic principles and operation of X25, Frame Relay and ATM networks; introduction to the Internet protocols.

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Course SLD: Telecommunications services

Pre-requisite:

It is recommended to those considering studying this course as a “technical introduction” that StarTel course SLC “Telecoms networks” is studied first.

Course Aim:

After completing this course a trainee will be able to describe the services provided by modern telecommunications networks.

The topics covered by this course are:

PSTN services: Capabilities and features of a POTS service and modern PSTN services; PABX and Centrex services.

ISDN equipment and services: Basic components of ISDN inc. NTU and TE; typical applications of the 2B + D channels.

Wide Area Networks: Applications and features of public X25, Frame Relay and ATM services; explanations of CIR, Class of Service and Quality of Service.

Local access to data services: Capabilities of analogue modems, ISDN, ADSL, SDSL and HDSL broadband connections; features and capabilities of cable modem access to the Internet.

Introduction to the Internet: Open standards; Internet administration; the role of ISPs and NSPs; basic structure of the Internet; function of Web and name servers; WAP based mobile radio data services.

Mobile radio: GSM and PCS networks and services; PSTN interfacing; roaming; tariffs; enhanced data services inc. GPRS and HSCSD.

Introduction to 3G mobile services: The need for 3rd Generation (3G) mobile systems; differences between GSM and 3G systems; 3G services including enhanced messaging and location services and faster Internet access.