QUALIFICATION UNIT PACK

2231-03 Diploma for Information Technology and Telecommunications Professionals at SCQF Level 6

Knowledge Units

April 2013 Version 1.0

City & Guilds

Qualification at a glance

Subject area	**Information Technology and Telecommunications Professionals**
City & Guilds number	2231
Age group approved	16+
Assessment	Portfolio and assignment
Fast track	Available
Support materials	Centre handbook Unit packs Assignments
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	**City & Guilds number**	**Accreditation number**
Diploma for Information Technology and Telecommunications Professionals at SCQF Level 6	2231-03	R307 04

Contents

1 Introduction

This unit pack contains the **knowledge units** only - Group B

Please see the other two unit packs for the:-

Work based - Group A
User - Group C

The Unit packs should be read in conjunction with the Diploma for Information Technology and Telecommunications Professionals at SCQF Level 6 Qualifications handbook for centres, which contains the following important information:

- Introduction to the qualifications
- Centre requirements
- Structure of the qualifications
- Course design and delivery

Barred combinations

Units that have a significant overlap in content are 'barred combinations'. Learners can take units that are barred and they will appear on the learner's Certificate of Unit Credit (CUC), but barred units will not both/all count towards the credit required for a qualification.

2 Units

Structure of units

These units each have the following:

- City & Guilds reference number
- title
- level
- credit value
- relationship to NOS, other qualifications and frameworks
- endorsement by a sector or other appropriate body
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance.

Unit 118 Data representation and manipulation for IT and Telecoms 1

Accreditation number:	UC71 04
Level:	SCQF 5
Credit value:	8
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Manipulate real numbers and integers
Assessment criteria
The learner can: 1.1 Describe the difference between real numbers and integers 1.2 Express numbers in power and scientific notation 1.3 Perform arithmetic on numbers in power and scientific notation including multiplication and division of powers 1.4 Round real numbers and estimate the resulting error 1.5 Describe how real numbers and integers are represented in computer memory.

Learning outcome
The learner will: 2. Use co-ordinate systems and vectors, and linear transformations
Assessment criteria
The learner can: 2.1 Describe two dimensional co-ordinate systems 2.2 Represent simple shapes by finding the co-ordinates of the vertices 2.3 Describe vectors 2.4 Produce the polar representation of vectors 2.5 Offset and scale shapes described by co-ordinates 2.6 Convert between linear and polar co-ordinates 2.7 Describe co-ordinate systems used in programming output devices.

Learning outcome
The learner will: 3. Use simple functions and basic algebraic operations
Assessment criteria
The learner can: 3.1 Express simple problems as mathematical equations 3.2 Simplify and change the subject of simple equations 3.3 Describe the concept of a function 3.4 Obtain the equation of a straight line from a graph 3.5 Describe the basic properties of a circle and triangle 3.6 Apply trigonometric and inverse trigonometric functions.

Learning outcome
The learner will: 4. Apply Boolean algebra to problem situations
Assessment criteria
The learner can: 4.1 Describe how binary states can be used to represent physical systems 4.2 Identify and label the inputs and outputs of a binary representation 4.3 Produce a truth table corresponding to a binary representation 4.4 Express a truth table as a Boolean equation 4.5 Simplify a Boolean equation using algebraic methods.

Unit 118 Data representation and manipulation for IT and Telecoms 1

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 119 Data modelling 1

Accreditation number:	UC73 04
Level:	SCQF 5
Credit value:	4
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Know the concepts of logical data modelling
Assessment criteria
The learner can: 1.1 Identify entities, attributes and relationships 1.2 State the objectives of data normalisation and describe how the process is carried out 1.3 Describe the purpose of keys.

Learning outcome
The learner will: 2. Use data modelling techniques to create logical data models
Assessment criteria
The learner can: 2.1 Identify and name entities and their attributes, assigning the correct type and size 2.2 Identify and represent appropriate entity relationships 2.3 Use a standard notation to create a logical data model of a normalised data set.

Unit 119 Data modelling 1

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 120 Computer games development 1

Accreditation number:	UC75 04
Level:	SCQF 5
Credit value:	4
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Understand computer game components
Assessment criteria
The learner can: 1.1 Identify the hardware and software components of a computer game system 1.2 Identify the activities required to develop modern computer games 1.3 Identify the components required to develop a computer game 1.4 Describe the features of an existing computer game.

Learning outcome
The learner will: 2. Be able contribute to the development of a computer game specification
Assessment criteria
The learner can: 2.1 Outline the purpose of a pre production proposal document and an implementation plan 2.2 Contribute to the production of a pre-production proposal document for a computer game project 2.3 Contribute to the production of an implementation plan for a computer game development.

Learning outcome
The learner will: 3. Be able to implement a component of a computer game
Assessment criteria
The learner can: 3.1 Design a component of a computer game 3.2 Develop a component of a computer game.

Unit 120 Computer games development 1

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 121 System architecture 1

Accreditation number:	UC77 04
Level:	SCQF 5
Credit value:	6
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills
Aim:	This unit provides the learner with a basic knowledge of how data is represented and processed in computer systems. The learner will develop an understanding of the features and functions of a computer operating system for stand-alone and distributed systems.

Learning outcome
The learner will: 1. Know the representation of information within a computer
Assessment criteria
The learner can: 1.1 Outline how number systems and data representation are used to store information in a computer 1.2 Identify the role of input, output and storage devices 1.3 List the characteristics of C.P.U. components and outline the operation of the Fetch Execute Cycle 1.4 Outline the operation of a peripheral device.

Learning outcome
The learner will: 2. Know and use an operating environment
Assessment criteria
The learner can: 2.1 Describe the purpose of an operating system 2.2 Use operating system interfaces and functions 2.3 Describe the methods of process management in computer operating systems 2.4 Identify how operating system features can contribute to data and system security.

Learning outcome
The learner will: 3. Know the principles of distributed computer operations
Assessment criteria
The learner can: 3.1 Outline the function and operation of operating systems used in distributed computer systems 3.2 Describe the functions of computer networking devices.

Unit 121 System architecture 1

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 122 Web development 1

Accreditation number:	UC80 04
Level:	SCQF 5
Credit value:	3
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Know web architecture and components
Assessment criteria
The learner can: 1.1 List the hardware and software components which enable the internet and web 1.2 State the role of the TCP/IP protocol 1.3 State the role of internet service providers, web hosting services and domain name registrars 1.4 Identify available types of web functionality.

Learning outcome
The learner will: 2. Know about the technologies used to build and operate websites
Assessment criteria
The learner can: 2.1 State the purpose of markup languages and list commonly used examples 2.2 Identify the roles of: a)web runtime environments b)web application programming languages; and databases c)in building websites and web applications 2.3 Identify typical product stack combinations that can be used for web development.

Learning outcome
The learner will: 3. Implement specified components of a web-site
Assessment criteria
The learner can: 3.1 State the components required to produce a web-site 3.2 Design specified components of a web-site 3.3 Develop specified components of a web-site 3.4 Test specified components of a web-site.

Unit 122 Web development 1

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 123 Introduction to IT and Telecoms systems development

Accreditation number:	UC83 04
Level:	SCQF 5
Credit value:	6
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Understand IT and Telecoms Systems and the roles of personnel
Assessment criteria
The learner can: 1.1 Explain the role of IT and Telecoms systems in society 1.2 Describe the major components of a contemporary IT or Telecoms system 1.3 Describe the roles of personnel in the development, operation and use of IT or Telecoms System.

Learning outcome
The learner will: 2. Understand Systems Development Life Cycle (SDLC) models
Assessment criteria
The learner can: 2.1 Describe top down, bottom up and integrated approaches to systems development 2.2 Explain the purposes of the initiation, analysis, design and implementation phases of the IT SDLC 2.3 Identify the advantages and disadvantages of the traditional ('waterfall') SDLC model 2.4 Describe two other SDLC models, identifying the type of development for which they are suited.

Learning outcome
The learner will: 3. Understand systems development processes
Assessment criteria
The learner can: 3.1 Describe the advantages and disadvantages of different solution types 3.2 Explain the importance of quality assurance and meeting customer requirements during the SDLC and the means by which they can be achieved 3.3 Describe the applicability of different methods of gathering information to inform systems development.

Unit 123 Introduction to IT and Telecoms systems development

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 125 Networking principles 1

Accreditation number:	UC85 04
Level:	SCQF 5
Credit value:	6
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Know different network infrastructure topologies
Assessment criteria
The learner can: 1.1 Describe logical and physical network topologies as given in the IEEE802 standards for LANs and WANs 1.2 Describe the different types of network cabling systems and their associated connectors 1.3 Describe the different types of wireless LAN 1.4 List the functions of repeaters, bridges, switch routers and gateways, identifying their roles in a network topology 1.5 Describe the difference between passive, active and intelligent hubs.

Learning outcome
The learner will: 2. Know the OSI model and the TCP/IP suite
Assessment criteria
The learner can: 2.1 State the function of the OSI model layers 2.2 List the TCP/IP protocols 2.3 List the types of addresses used on networks and why they are used.

Learning outcome
The learner will: 3. Know the advantages and disadvantages of different types of network
Assessment criteria
The learner can: 3.1 Describe the properties of different types of networks 3.2 Describe the advantages and disadvantages of different types of networks.

Learning outcome
The learner will: 4. Know media access control methods and protocols used in local area networks
Assessment criteria
The learner can: 4.1 Describe types of media access control methods used in networked systems 4.2 Describe protocols used in networked systems 4.3 Explain what is meant by a collision and how network systems deal with them.

Unit 125 Networking principles 1

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 126 Telecommunications principles 1

Accreditation number:	UC87 04
Level:	SCQF 5
Credit value:	7
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Know the electromagnetic spectrum as applied to telecommunications
Assessment criteria
The learner can: 1.1 Describe the physical properties of electromagnetic radiation 1.2 Describe the relationship between frequency and wavelength 1.3 List the principal bands of the electromagnetic spectrum and their associated frequencies and wavelengths 1.4 Identify the main telecommunications applications of electromagnetic radiation.

Learning outcome
The learner will: 2. Know the relationship between telecommunication circuits and transmission lines
Assessment criteria
The learner can: 2.1 Identify the circuit properties (Resistance, Capacitance, Inductance and Leakance) of alternating current (AC) circuits 2.2 Describe the effects of circuit properties on transmission lines 2.3 Design an equivalent circuit model of a transmission line using the primary line constants 2.4 Describe characteristic impedance in transmission lines including open circuit, short circuit and matched termination.

Learning outcome
The learner will: 3. Know how binary information is transmitted as a digital signal
Assessment criteria
The learner can: 3.1 Describe the properties of digital signals including frequency, mark space ratio and triggered timing 3.2 Describe the advantages of digital signals in terms of regeneration, accuracy and recovery 3.3 State why digital signals need to be modulated onto an analogue carrier 3.4 Use keying to demonstrate how a digital signal is modulated onto an analogue carrier.

Learning outcome
The learner will: 4. Understand how an analogue signal is converted to a digital signal
Assessment criteria
The learner can: 4.1 Explain different ways of converting an analogue signal to a digital signal 4.2 Explain linear and non-linear forms of encoding 4.3 Calculate signal to noise quantisation errors 4.4 Explain Aliasing in telecommunications terms and how it can be overcome 4.5 Explain the use, and limitations, of the Nyquist rule in signal sampling.

Learning outcome
The learner will: 5. Know signal multiplexing
Assessment criteria
The learner can: 5.1 Describe frequency, synchronous and asynchronous signal multiplexing:

Unit 126 Telecommunications principles 1

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 218 Data representation and manipulation for IT and Telecoms 1

Accreditation number:	UC71 04
Level:	SCQF 6
Credit value:	8
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Apply matrix methods
Assessment criteria
The learner can: 1.1 Explain matrices as a method of representing ordered data and their relationship with computer program variable arrays 1.2 Use index notation to reference the cells of a matrix 1.3 Perform add, subtract and scalar multiplication operations on a matrix 1.4 Multiply two matrices 1.5 Find: a)the inverse of a matrix by elementary row operations b)the transpose of a matrix 1.6 Apply matrix techniques to a range of applications including: a)solving simultaneous linear equations b)vector transformation and rotation c)maps and graphs.

Learning outcome
The learner will: 2. Apply series, probability and recursions
Assessment criteria
The learner can: 2.1 Give a functional expression for a series 2.2 Express a series recursively 2.3 Find the sum of a series 2.4 Express probabilities as percentages, fractions and decimals 2.5 Apply series, probability and recursion techniques to develop a solution to a range of problems.

Learning outcome
The learner will: 3. Apply graph theory
Assessment criteria
The learner can: 3.1 Describe the components of a graph and their properties 3.2 Explain the characteristics of undirected, directed and mixed graphs 3.3 Represent a set of connected objects as a graph 3.4 Describe the type of problem which can be modelled by a weighted graph.

Unit 218 Data representation and manipulation for IT and Telecoms 1

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 219 Data modelling 2

Accreditation number:	UC74 04
Level:	SCQF 6
Credit value:	6
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Understand the concepts of logical data modelling
Assessment criteria
The learner can: 1.1 Describe entities and the types of attributes which can be assigned to them 1.2 Describe the type of relationships which can exist between entities 1.3 Explain the objectives of data normalisation and describe the Third Normal Form (3NF) 1.4 Explain the types of keys and their use 1.5 Describe an application where un-normalised or de-normalised data may be used 1.6 Describe the types of standard notation which can be used to represent data sets as logical data models.

Learning outcome
The learner will: 2. Use logical data modelling techniques
Assessment criteria
The learner can: 2.1 Identify and name entities, assigning the correct attributes 2.2 Identify and represent entity relationships, assigning the correct type 2.3 Normalise a data set to Third Normal Form (3NF).

Learning outcome
The learner will: 3. Use data modelling techniques to create and refine logical data models
Assessment criteria
The learner can: 3.1 Identify entities which will be accessed for enquiry and/or update 3.2 Identify access sequences and triggers 3.3 Create access rules/methods 3.4 Use a standard notation to represent the logical data model of an un-normalised data set.

Unit 219 Data modelling 2

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 220 Computer games development 2

Accreditation number:	UC76 04
Level:	SCQF 6
Credit value:	7
Relationship to NOS:	T his unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills
Aim:	This unit is about the knowledge and skills required to design, develop and test computer games. The candidate will gain an appreciation of the computer games industry and the development process for game components.

Learning outcome
The learner will: 1. Understand computer game components
Assessment criteria
The learner can: 1.1 Describe the hardware and software components of a computer game system.

Learning outcome
The learner will: 2. Understand the processes of computer games development
Assessment criteria
The learner can: 2.1 Describe the stages of the evolution of computer games 2.2 Describe the roles and activities required to develop computer games 2.3 Explain computer game development processes and terminology 2.4 Explain computer game programming methods and techniques.

Learning outcome
The learner will: 3. Be able to evaluate existing computer games
Assessment criteria
The learner can: 3.1 Produce an evaluation of an existing computer game.

Learning outcome
The learner will: 4. Be able to develop a computer game specification
Assessment criteria
The learner can: 4.1 Describe the purpose of a pre production proposal document and an implementation plan. 4.2 Identify the components required to develop a computer game 4.3 Produce a pre-production proposal document for a computer game project 4.4 Produce an implementation plan for a computer game development.

Learning outcome
The learner will: 5. Be able to Implement components of a computer game
Assessment criteria
The learner can: 5.1 Design components of a computer game 5.2 Develop components of a computer game 5.3 Test components of a computer game.

Unit 220 Computer games development 2

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 221 System architecture 2

Accreditation number:	UC78 04
Level:	SCQF 6
Credit value:	8
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills
Aim:	This unit provides the learner with an understanding of the computer architecture for stand-alone and distributed or networked systems. The learner will develop an understanding of the features and functions of a computer operating system and be able to configure it for use.

Learning outcome
The learner will: 1. Understand the representation of information within a computer and the way it is processed
Assessment criteria
The learner can: 1.1 Describe how number systems and data representation are used to store and process different types of data 1.2 Describe the operation of input, output and storage devices using correct technical terminology 1.3 Describe the characteristics of C.P.U. components and the operation of the Fetch Execute Cycle.

Learning outcome
The learner will: 2. Use and configure operating systems
Assessment criteria
The learner can: 2.1 Use and configure operating system interfaces 2.2 Use and configure operating system functions to improve performance 2.3 Describe how concurrent processes are managed in computer operating systems 2.4 Describe how operating system features can contribute to data and system security.

Learning outcome
The learner will: 3. Understand the principles of distributed computer operations
Assessment criteria
The learner can: 3.1 Outline the features of different architectures of distributed computer systems 3.2 Describe the functions and operation of operating systems used in distributed computer systems 3.3 Describe the operation of computer networking devices 3.4 Describe the characteristics and operation of distributed applications.

Unit 221 System architecture 2

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 222 Web development 2

Accreditation number:	UC81 04
Level:	SCQF 6
Credit value:	12
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Understand web architecture and components
Assessment criteria
The learner can: 1.1 Describe the hardware and software components which enable the internet and web 1.2 Explain the role of network protocols in web architecture 1.3 Explain the role of internet service providers, web hosting services and domain name registrars 1.4 Describe available types of web components.

Learning outcome
The learner will: 2. Understand the technologies that can be used to build and operate a website
Assessment criteria
The learner can: 2.1 Explain the use of markup languages 2.2 Explain the use and functionality of: a)web runtime environments b)web application programming languages 2.3 Explain the role of databases in building websites and web applications 2.4 Identify typical product stack combinations that can be used for web development.

Learning outcome
The learner will: 3. Produce a website design for a given brief
Assessment criteria
The learner can: 3.1 Produce a proposal document for a web-site design 3.2 Identify the components required by a web-site design 3.3 Produce an implementation plan for a web-site development project.

Learning outcome
The learner will: 4. Implement a website from a design specification
Assessment criteria
The learner can: 4.1 Develop a fully functional website to meet requirements 4.2 Test a website and review against requirements.

Unit 222 Web development 2

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 224 Software design fundamentals

Accreditation number:	UC84 04
Level:	SCQF 7
Credit value:	8
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Understand the principles of software design
Assessment criteria
The learner can: 1.1 Describe the role of software design and computer programming in the IT Systems Development Life Cycle (SDLC) 1.2 Describe the application and limits of the procedural, object oriented and event driven programming paradigms and the available supporting tools and environments 1.3 Explain sequence, selection and iteration as used in computer programming 1.4 Explain abstraction of data and code in computer programming 1.5 Explain the use of predefined data and code in computer programming 1.6 Explain the importance of the understandability of code and how this can be improved by naming, comments and layout 1.7 Describe how a) efficiency b) reliability c) robustness d) usability e) portability f) maintainability contribute to the quality of code.

Learning outcome
The learner will: 2. Be able to apply the principles of software design
Assessment criteria
The learner can: 2.1 Develop algorithms to represent problems 2.2 Define data and file storage requirements including predefined data items 2.3 Define program structures including predefined code items 2.4 Describe required inputs and outputs 2.5 Use tools to express software designs.

Unit 224 Software design fundamentals

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 225 Networking principles 2

Accreditation number:	UC86 04
Level:	SCQF 6
Credit value:	10
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Understand physical and logical network topologies
Assessment criteria
The learner can: 1.1 Describe common physical network topologies 1.2 Explain the difference between logical and physical network topologies 1.3 Describe the functions and role of hardware and software components used to implement common data communication systems 1.4 Identify the bandwidth limitations of different types of network cabling and connectors 1.5 Describe the different types of wireless standards.

Learning outcome
The learner will: 2. Understand the Open System Interconnection (OSI) model
Assessment criteria
The learner can: 2.1 Describe the OSI model and how its layers relate to each other 2.2 Explain the function of each layer of the OSI model 2.3 Describe the key features, protocols and standards of each OSI layer.

Learning outcome
The learner will: 3. Understand the Internet Protocol Suite (TCP/IP)
Assessment criteria
The learner can: 3.1 Explain the Internet Protocol Suite (TCP/IP) and the function of its four layers 3.2 Describe the key features, protocols and standards of each TCP/IP layer 3.3 Explain how TCP and IP protocols are used to facilitate delivery of data packets 3.4 Explain how TCP/IP relates to the OSI model.

Learning outcome
The learner will: 4. Design a LAN Infrastructure to meet a given requirement
Assessment criteria
The learner can: 4.1 Design a routed network to meet given specification. 4.2 Select the components required to construct and configure the network 4.3 Describe how network security would be implemented. 4.4 Prepare a test plan.

Unit 225 Networking principles 2

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 226 Telecommunications principles 2

Accreditation number:	UC88 04
Level:	SCQF 6
Credit value:	10
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Understand the principles of alternating current (AC) circuits
Assessment criteria
The learner can: 1.1 Explain reactance in circuits 1.2 Explain impedance in terms of resistive and reactive components 1.3 Explain the characteristics of series and parallel resonant circuits 1.4 Calculate the resonant frequency of a circuit.

Learning outcome
The learner will: 2. Understand the effects of line impairments on a transmitted signal
Assessment criteria
The learner can: 2.1 Explain the concept of decibel (dB) as a unit of loss 2.2 Explain the concept of dBm as a unit of power 2.3 Define the concept of signal-to-noise ratio as applied to transmission lines 2.4 Calculate using dBs and dBms the a) total loss of a system from individual losses b) total loss of a system from input and output signal levels c) output signal level from total loss and input signal level d) signal-to-noise ratios.

Learning outcome
The learner will: 3. Be able to apply the characteristics of transmission lines
Assessment criteria
The learner can: 3.1 Demonstrate the importance of the primary line constants in transmission lines 3.2 Explain the effect of the primary line constants R, G, L & C on the characteristic impedance of transmission lines 3.3 Define the concept of angular frequency as applied to transmission lines 3.4 Calculate the characteristic impedance of finite and infinite line lengths using the primary line constants 3.5 Calculate the characteristic impedance of a parallel pair of wires and co-axial cable 3.6 Produce an equivalent circuit model of a transmission line in terms of resistance, capacitance and inductance 3.7 Calculate the bandwidth of a transmission line in terms of frequency between half power points.

Learning outcome
The learner will: 4. Understand the transmission of digital signals over transmission media
Assessment criteria
The learner can: 4.1 Demonstrate the representation of binary information and explain the advantages of each type a) non-return to zero (NRZ) digital encoding from given values b) return to zero (RTZ) digital encoding from given values c) bi-phase digital encoding (Manchester) from given values d) bi-phase digital encoding (Differential Manchester) from given values 4.2 Explain the concept of bit rate and bit error rate (BER) 4.3 Explain digital signal impairments in terms of delay, jitter and binary errors 4.4 Explain the effects of delay, limited bandwidth and jitter on the extraction of binary information from a digital signal.

Learning outcome
The learner will: 5. Understand the process of modulating an analogue carrier frequency using digital signals
Assessment criteria
The learner can: 5.1 Explain digital modulation using analogue frequency carriers including: a) shift keying b) constellation diagrams c) channel capacity calculation 5.2 Explain the need for filters and their effect on digitally modulated signals 5.3 Calculate the Baud rate of given link states using given values

Learning outcome
The learner will: 6. Understand multiplexing digital and analogue signals over transmission media
Assessment criteria
The learner can: 6.1 Explain the concept of a) frequency division multiplexing b) synchronous time division multiplexing c) asynchronous time division multiplexing d) digital time division multiplexing e) code division multiplexing f) wavelength division multiplexing g) coarse wavelength division multiplexing h) dense wavelength division multiplexing.

Unit 226 Telecommunications principles 2

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 227 Fibre telecommunications techniques

Accreditation number:	UC89 04
Level:	SCQF 6
Credit value:	15
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos.
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Understand the properties, structures and components included in typical fibre telecommunication networks
Assessment criteria
The learner can: 1.1 Describe the different types of optical fibre 1.2 Describe the physical components required to build a fibre infrastructure 1.3 Describe the different structures used in fibre networks 1.4 Explain when different fibre network structures should be used.

Learning outcome
The learner will: 2. Understand safe working practices when working with optical fibre networks
Assessment criteria
The learner can: 2.1 Identify key safety considerations when working with optical fibre 2.2 Identify any existing risk assessments for working with optical fibre 2.3 Explain how to dispose of redundant or damaged optical fibres.

Learning outcome
The learner will: 3. Know the quality standards and documentation requirements when working on the optical fibre network
Assessment criteria
The learner can: 3.1 Explain the quality standards applicable for installation and maintenance work on the optical fibre network 3.2 Explain the technical documentation required before and after undertaking work on the fibre network.

Learning outcome
The learner will: 4. Be able to prepare and install optical fibre components in exchanges and customer premises
Assessment criteria
The learner can: 4.1 Prepare optical fibre components for use 4.2 Provide fibres from a customer premises point of entry to the equipment fibre pigtails for both two-fibre and single-fibre working 4.3 Test components before commissioning the components.

Learning outcome
The learner will: 5. Be able to build an external fibre network
Assessment criteria
The learner can: 5.1 Prepare cables for splicing 5.2 Manage cables on single circuit trays 5.3 Splice fibres cables on single circuit trays.

Learning outcome
The learner will: 6. Be able to construct and re-enter a fibre closure
Assessment criteria
The learner can: 6.1 Explain where various fibre options should be used 6.2 Construct a fibre closure 6.3 Re-enter an existing closure.

Unit 227 Fibre telecommunications techniques

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 321 System architecture 3

Accreditation number:	UC79 04
Level:	SCQF 7
Credit value:	8
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos.
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills
Aim:	This unit provides the learner with an understanding of the computer architecture for stand-alone and distributed or networked systems. The learner will develop an understanding of the features and functions of a computer operating system and be able to configure it for use.

Learning outcome
The learner will: 1. Understand the representation of information within a computer and the way it is processed
Assessment criteria
The learner can: 1.1 Describe how number systems and data representation are used to store and process different types of data 1.2 Describe the operation of input, output and storage devices using correct technical terminology 1.3 Describe the characteristics of C.P.U. components and the operation of the Fetch Execute Cycle.

Learning outcome
The learner will: 2. Use and configure operating systems
Assessment criteria
The learner can: 2.1 Use and configure operating system interfaces 2.2 Use and configure operating system functions to improve performance 2.3 Describe how concurrent processes are managed in computer operating systems 2.4 Describe how operating system features can contribute to data and system security.

Learning outcome
The learner will: 3. Understand the principles of distributed computer operations
Assessment criteria
The learner can: 3.1 Outline the features of different architectures of distributed computer systems 3.2 Describe the functions and operation of operating systems used in distributed computer systems 3.3 Describe the operation of computer networking devices 3.4 Describe the characteristics and operation of distributed applications.

Unit 321 System architecture 3

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

Unit 322 Web development 3

Accreditation number:	UC82 04
Level:	SCQF 7
Credit value:	15
Relationship to NOS:	This unit is based on the e-skills UK NOS for IT professionals (PROCOM) available from www.e-skills.com/nos
Endorsement by a sector or regulatory body:	This unit is endorsed by e-skills

Learning outcome
The learner will: 1. Design a web site to address loosely-defined requirements
Assessment criteria
The learner can: 1.1 Identify the key design features inherent within a requirements specification 1.2 Use planning tools and techniques to create a site map 1.3 Evaluate different design models and select the most appropriate to meet requirements.

Learning outcome
The learner will: 2. Build websites to address well-defined specifications
Assessment criteria
The learner can: 2.1 Explain the advantages and disadvantages of various web development methodologies and technologies 2.2 Select and Use a variety of web development tools 2.3 Describe the use of (X)HTML to develop websites 2.4 Write the source code for web pages in clean XHTML according to a specification 2.5 Describe how to use CSS to standardise the overall style of a website 2.6 Write the source code for CSS web pages according to a specification.

Learning outcome
The learner will: 3. Understand the technology and tools needed to use multimedia in the context of a website
Assessment criteria
The learner can: 3.1 Explain the advantages and disadvantages of various types of multimedia file format 3.2 Explain the advantages and disadvantages of different types of multimedia element in relation to different contexts 3.3 Embed functional multimedia components in a website.

Learning outcome
The learner will: 4. Understand the technology and tools needed to store, retrieve and manipulate external data in the context of a website
Assessment criteria
The learner can: 4.1 Describe how database components can be linked to a website 4.2 Embed database components in a website.

Learning outcome
The learner will: 5. Plan and implement testing of a website
Assessment criteria
The learner can: 5.1 Develop and apply a test strategy consistent with the design 5.2 Determine expected test results 5.3 Record actual test results to enable comparison with expected results 5.4 Analyse actual test results against expected results to identify discrepancies 5.5 Investigate test discrepancies to identify and rectify their causes 5.6 Explain the need for testing on different platforms and browsers.

Learning outcome
The learner will: 6. Understand the need for Web standards
Assessment criteria
The learner can: 6.1 Explain the role of the W3C 6.2 Explain W3C standards and their application in site coding 6.3 Discuss web accessibility and usability issues from the viewpoint of an IT professional.

Unit 322 Web development 3

Supporting information

Guidance

Further guidance is set out in the CBQ Assessment principles developed by e-skills UK and agreed by the Joint Awarding Body Forum.

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