UNIT HANDBOOK

City & Guilds Level 2/3 Award/ Certificate/Diplomas in ICT Systems and Principles (7540-12/13)

Level 3 and 4 Unit Handbook

March 2022 Version 5.0

City & Guilds

Qualification at a glance

Subject area	**ICT Systems and Principles**
City & Guilds number	7540-12/13
Age group approved	All
Assessment	By means of either set assignment or portfolio. Some units have a paired multiple-choice test (please see individual units for details)
Grading	Pass/Fail
Support materials	Assignments 7540 Qualification Handbook
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds number	Ofqual number
City & Guilds Level 2 Award in ICT Systems and Principles	7540-12	500/3475/3
City & Guilds Level 2 Certificate in ICT Systems Support	7540-12	501/1623/X
City & Guilds Level 2 Diploma in ICT Systems Support	7540-12	501/1430/X
City & Guilds Level 2 Diploma in ICT Systems and Principles for IT Professionals	7540-12	501/1859/6
City & Guilds	7540-13	500/3476/5
City & Guilds Level 3 Diploma in ICT Systems Support	7540-13	501/1585/6
City & Guilds Level 3 Diploma for ICT Systems and Principles for IT Professionals	7540-13	501/0277/1

Version and date	Change detail	Section
2.0 Aug 2012	Inclusion of Unit 031	Units
3.1 Sep 2013	Amended formatting of AC's – Unit 363	Units
4.0 November 2013	Missing units 111, 393 & 394 added.	Structure of units
4.0 January 2014	Units 702 & 703 added.	Structure of units
4.1 February 2014	Added range to unit 370	Units
5.0 March 2022	Units added and deleted as part of a structural amendment of this qualification.	All

Contents

1 Units

Structure of units

These units each have the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- unit aim
- relationship to NOS, other qualifications and frameworks
- endorsement by a sector or other appropriate body
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria

Assignments are available for some units; these units are indicated in the table below:

Unit Number	UAN	Title	Assessment Available
030	R/602/1173	Customer Support Provision for the ICT Professional	Assignment
031	J/601/3250	Networking principles	Assignment
032	T/602/2557	Implementing an ICT Systems Security policy	Assignment
033	L/601/3251	Software design fundamentals	Assignment
040	R/601/3509	Principles of ICT system and data security	Assignment
041	T/601/3504	Systems architecture	Assignment
042	D/601/3254	Telecommunications principles	Assignment
043	L/601/3511	Software testing	Assignment
044	K/601/3256	Web development	Assignment
045	F/601/3246	Advanced data representation and manipulation for IT	Assignment
085	F/502/4611	Drawing and planning software	Assignment
086	T/502/4556	Database software	Assignment
090	A/502/4574	Design software	Assignment

091	H/502/4567	Desktop publishing software	Assignment
092	T/502/4301	Using Email	Assignment
093	R/502/4614	Imaging software	Assignment
094	T/502/4623	Presentation software	Assignment
095	J/502/4626	Spreadsheet software	Assignment
096	Y/502/4629	Word processing software	Assignment
097	Y/502/4632	Website software	Assignment
098	H/502/4617	Multimedia software	Assignment
099	F/502/4298	Using the Internet	Assignment
321	R/501/3998	Testing ICT systems	Assignment
328	R/501/4004	Maintain ICT equipment and systems	Assignment

355	K/501/4008	Designing and creating advanced websites	Assignment
356	J/501/4002	Design and maintain ICT networks software components	Assignment
357	T/501/4013	Design and plan for an internal network cabling infrastructure	Assignment
358	M/501/4012	Design and plan for an external overhead network cabling infrastructure	Assignment
359	F/501/4015	Design and plan for an external underground network cabling infrastructure	Assignment
361	J/501/3996	Install, configure and integrate networked hardware and software	Assignment and online multiple choice test (661)*
362	L/501/3997	Install, configure and upgrade ICT software	Assignment
363	H/501/4010	Network management and security	Assignment
364	M/501/3992	Plan for the delivery of ICT support services and assist in the acquisition of ICT systems	Assignment and online multiple choice test (664)*
365	L/501/4003	Principles of planning telecommunications services	Assignment
366	D/501/4006	Requirements analysis and systems specifications	Assignment
367	A/501/4000	ICT repair centre procedure	Assignment
368	Y/501/3999	ICT systems and network management	Assignment
369	F/501/4001	Develop ICT technical documentation and procedures	Assignment
370	M/501/4009	Voice and data communications	Assignment
384	K/502/1119	Business concepts	Assignment
387	H/502/1118	Unix operating system	Assignment
388	D/502/1117	Creative problem solving	Assignment

389	H/501/4007	Develop software using SQL	Assignment
390	Y/502/1116	IT consulting skills	Assignment
391	R/502/1115	The technologies of the Internet	Assignment
393	L/602/4637	Communications workshop practice	Assignment
394	T/600/0249	Health and Safety in the Engineering Workplace	Assignment
414	A/601/3505	Systems architecture	Portfolio
437	T/506/8167	Business intelligence	Portfolio
438	F/506/8169	Test-driven Development	Portfolio
608	R/507/0184	Fundamentals of Linux based operating systems	Portfolio
609	Y/507/0185	Implementing and maintaining cloud technologies and infrastructure	Portfolio
610	R/507/0198	Configure and manage Linux based operating systems	Portfolio
611	F/507/0200	Implement and manage a network	Portfolio
612	D/507/0219	Securing ICT systems and networks	Portfolio
613	Y/507/0221	Install and configure a server	Portfolio
614	K/507/0224	Implement and manage a mobile computing environment	Portfolio
615	J/507/0229	Developing security for mobile apps on iOS	Portfolio
616	T/507/0226	Developing security for mobile apps on android	Portfolio
630	A/507/0292	Administering server databases	Portfolio
631	A/507/0289	Administering a Windows based server	Portfolio
632	R/507/0332	Configuring advanced Windows server services	Portfolio
633	D/507/0334	Configuring Windows based systems	Portfolio
634	H/507/0335	Installing and configuring Windows based servers	Portfolio
635	A/507/0275	Programming in HTML5 with JavaScript and	Portfolio

		CSS3	
636	T/507/0338	Implementing a Windows based data warehouse	Portfolio
637	A/507/0342	Managing a Windows based system	Portfolio
638	T/507/0341	Designing and implementing a Windows desktop infrastructure	Portfolio
639	M/507/0340	Implementing Windows desktop application environments	Portfolio
640	J/507/0344	Supporting Microsoft exchange server solutions	Portfolio
641	M/507/0337	Designing and implementing a Windows server infrastructure	Portfolio
642	F/601/3179	Creating an event driven computer program	Portfolio
643	R/601/3171	Creating a procedural computer program	Portfolio
644	L/601/3184	Creating an object-oriented computer program	Portfolio
645	H/507/0173	Introduction to networks	Assignment
646	K/507/0174	Routing and switching essentials	Assignment
647	M/507/0175	Scaling networks	Portfolio
648	T/507/0176	Connecting networks	Portfolio
650	F/601/3165	Computer games development	Portfolio
653	R/601/3249	Investigating and defining customer requirements for ICT systems	Assignment
857	K/505/5786	Principles of information governance and assurance	Centre devised
858	T/505/5788	Testing the security of information systems	Portfolio
859	T/505/5791	Carrying out Information Security Risk Assessment	Portfolio
860	F/505/5793	Investigating Information Security	Portfolio

		incidents	
862	F/505/5812	Carrying out Information Security Incident Management activities	Portfolio
863	R/505/5801	Carrying out Information Security forensic examinations	Portfolio
865	A/505/5808	Carrying out Information Security audits	Portfolio
866	A/500/7340	System operation	Portfolio
867	D/500/7332	System management	Portfolio
868	K/500/7379	User profile administration	Portfolio
871	R/505/5815	Principles of information security testing	Centre devised
872	K/505/5819	Principles of secure system development	Centre devised
874	L/601/3203	Data modelling	Portfolio
877		Carrying out electronic forensic examinations	Portfolio
878	A/505/5811	Carrying out Information Security audits	Portfolio
879	M/505/5806	Carrying out information security forensic examinations	Portfolio
880	J/505/5813	Carrying out Information Security Incident Management activities	Portfolio
881	A/505/5792	Carrying out Information Security Risk Assessment	Portfolio
882	L/505/5814	Carrying out Information Security Risk Management	Portfolio
883	J/601/3300	Designing and developing event-driven computer programs	Portfolio
884	T/601/3308	Designing and developing object-oriented computer programs	Portfolio
885	T/601/3311	Designing and developing procedural computer programs	Portfolio
886	A/601/0457	Human Computer	Portfolio

		Interaction	
887	R/602/1772	Investigating and Defining Customer Requirements for ICT Systems	Portfolio
888	D/505/5798	Investigating Information Security incidents	Portfolio
889	M/504/5504	IT & Telecoms System Management	Portfolio
890	R/504/5513	IT & Telecoms System Operation	Portfolio
891	A/505/5789	Testing the security of Information Systems	Portfolio
892	J/601/1286	Website design	Centre devised
893	R/601/1288	Website management	Centre devised

Where an assignment or vendor certification is not available, evidence from real work or simulated environments will benefit the learner and should be reflective, as well as meet policies and procedures of a work environment, especially where linked to current legislation and the values and principles for good practice in Independent Advocacy.

All vendor units can only be achieved by taking the relevant Vendor Certification.

*Both assessments must be completed before the unit is issued

When first developed, units 030–099, 321–391 and 653 were endorsed by e-skills UK.

Unit 030 Customer support provision for the ICT professional

UAN:	**R/602/1173**
Level:	3
Credit value:	12
GLH:	60
Aim:	This unit will enable the learner to provide technical customer support and understand the processes involved in improving the way in which customers use networked ICT systems

Learning outcome
The learner will: 1. Provide technical support to customers
Assessment criteria
The learner can: 1.1 determine customer requirements for ICT systems and services support 1.2 respond to individual customer requests for technical support using different communication techniques 1.3 use manual/written or electronic methods to record details of the customer request and the outcome 1.4 obtain technical support information from other sources 1.5 record and escalate unresolved technical support requests following agreed processes.

Learning outcome
The learner will: 2. Gather and evaluate feedback from customers on improving technical support provision
Assessment criteria
The learner can: 2.1 design and use suitable tools for gathering effective feedback from customers to improve technical support provision 2.2 obtain and analyse feedback from customers 2.3 document analysis findings and propose recommendations.

Learning outcome
The learner will: 3. Implement recommended action plan
Assessment criteria
The learner can: 3.1 analyse support records or logs identifying patterns of customer support request 3.2 prepare an action plan to implement the recommendations.

Learning outcome
The learner will: 4. Provide remote technical customer support
Assessment criteria
The learner can: 4.1 determine the customers' requirements for technical support in a remote situation 4.2 use available diagnostic tools to remotely investigate and inspect a system or system components as part of a fault-finding process 4.3 guide a remote user through a fault-finding process 4.4 record the fault-finding process and the results of tests or checks reported by the customer 4.5 advise on the corrective action to be taken to restore a system to working order and to confirm problem resolution.

Learning outcome
The learner will: 5. Provide coaching in technical skills for customers
Assessment criteria
The learner can: 5.1 identify types of customer and their knowledge 5.2 identify technical skills required by the customer and prepare a coaching plan 5.3 provide coaching to the customer in technical skills 5.4 obtain feedback regarding the effectiveness of the coaching 5.5 evaluate coaching delivered and make recommendations.

Unit 031 Networking principles

UAN:	**J/601/3250**
Level:	3
Credit value:	10
GLH:	75
Aim:	This unit is aimed at advanced Networking students who already possess the fundamentals of computer networks and desktop PC support and are now moving to study second- and third-line support roles where network operations and troubleshooting are now more fundamental to the job role. This qualification should be studied alongside a logical network design and server admin and server application infrastructure qualification. In addition a more fundamental network security qualification should also be studied.

Learning outcome
The learner will: 1. Understand physical and logical topologies and systems
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 **network topologies and hardware and software components** used to implement common data communication systems 1.4 identify common: • **cable types** and properties • **connector types** • **wiring standards** • **wireless standards**

Range
1.1 common physical network topologies Star, Ring, Bus, Mesh **1.3 network topologies and hardware and software components** Fast Ethernet, Token Ring, FDDI, NIC, UTP, MAC, CSMA/CD **1.4** **cable types:** Ethernet, coaxial, fibre **connector types:** Rj45, BNC, Fibre **wiring standards:** T565A / T565B **wireless standards:** 802.11a/b/g/n

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 describe 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/IP relates to the OSI model

Range
3.1 four layers Application, Transport, Network, Data Link

Unit 032 Implementing an ICT systems security policy

UAN:	**T/602/2557**
Level:	3
Credit value:	10
GLH:	60
Aim:	This unit will provide the learner with the basic knowledge and principles to implement a security policy on data networks and computer systems. Learners will be able to understand the practical steps a network/system administrator can take to mitigate the threats to the network and the consequent effects of any attacks. Additionally learners will be able to understand the business implications of network and system downtime as a result of attacks on computer systems.

Learning outcome
The learner will: 1. Be able to analyse and identify ICT system security issues
Assessment criteria
The learner can: 1.1 interpret building, network and system plans and diagrams 1.2 identify vulnerable areas within an ICT system and the different types of security risks in these areas 1.3 suggest the financial impact to the organisation due to ICT system downtime as a result of security issues 1.4 collate and record the data from the analysis and assessment 1.5 make suggestions for a security policy based upon the conclusions reached.

Learning outcome
The learner will: 2. Be able to implement security on email and instant messaging systems
Assessment criteria
The learner can: 2.1 analyse a given network/ICT system in relation to email and messaging privacy and security requirements 2.2 research current types of potential risk 2.3 research major cost implications of implementing security solutions 2.4 select and justify the choice of email and messaging security solution with respect to functionality, business requirements and budget availability 2.5 identify the issues and considerations surrounding email and messaging privacy with respect to current laws concerning privacy and data protection 2.6 implement basic security protection on an ICT system 2.7 make recommendations for an organisation wide policy with relation to email and messaging systems and document it.

Learning outcome
The learner will: 3. Be able to implement and maintain internet and network security
Assessment criteria
The learner can: 3.1 Interpret diagrams and summaries of installed networking equipment in an organisation 3.2 identify potential security threats and risks in network topologies and diagrams 3.3 Identify security risks associated with different networking media technologies 3.4 identify, install and configure hardware and software solutions to protect the network and client devices from attack 3.5 take appropriate action to remove unwanted networking protocols on the ICT network 3.6 select appropriate solutions and technologies to back up important data as part of disaster recovery strategies.

Learning outcome
The learner will: 4. Be able to maintain data integrity and system security
Assessment criteria
The learner can: 4.1 make appropriate recommendations for hardware and software to implement secure access to an organisation's networks 4.2 make recommendations to implement an organisation wide password policy 4.3 configure basic networking protocols in a secure manner on a range of different connections to an internet service provider (ISP) or other remote network.

Unit 033 Software design fundamentals

UAN:	**L/601/3251**
Level:	3
Credit value:	10
GLH:	80
Aim:	This unit covers the principles of software design and the application of the techniques used in software design to represent software solutions.

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 programming paradigms procedural, object oriented and event driven and the available supporting tools and environments (eg CASE tools, IDEs) 1.3 Explain sequence, selection and iteration as used in computer programming 1.4 Explain abstraction of data and code and the use of predefined data and code in computer programming 1.5 Explain the importance of the readability and understandability of code and how these can be improved by naming, comments and layout 1.6 Describe how the following factors contribute to the quality of code: efficiency, reliability, robustness, usability, portability and maintainability.

Learning outcome
The learner will: 2. Apply the techniques of software design
Assessment criteria
The learner can: 2.1 Develop algorithms to represent problems 2.2 Identify and define data and file storage requirements including predefined data items 2.3 Identify and define program structures including predefined code items 2.4 Identify and represent required inputs and outputs 2.5 Use tools (eg pseudocode) to express software designs.

Unit 040 Principles of ICT system and data security

UAN:	**R/601/3509**
Level:	3
Credit value:	9
GLH:	75
Aim:	This unit develops an understanding of the types of threat to ICT systems and data and methods of protecting against them. It also covers an understanding of the applications of cryptography to ICT systems and data.

Learning outcome
The learner will: 1. Understand the common types of threat to ICT systems and data
Assessment criteria
The learner can: 1.1 Describe common types of physical threats to ICT systems and data (hardware damage, loss and theft) 1.2 Describe common types of electronic threats to ICT systems and data (eg denial of service, data theft or damage, unauthorised use) 1.3 Explain the security vulnerabilities associated with remote access technologies (including wireless).

Learning outcome
The learner will: 2. Understand how to protect ICT systems
Assessment criteria
The learner can: 2.1 Describe methods of providing physical access control and security for ICT systems (locks, biometric controls, CCTV, shielding, fire detection and control) 2.2 Describe methods of providing electronic access control and security for ICT systems (firewalls, virtual networks, secure connection/transfer protocols, secure wireless connection) 2.3 Differentiate the following Access Control methods: • Mandatory • Discretionary • Role Based 2.4 Describe the operation of common types of malicious code:

- Virus
- Trojan
- Logic Bomb
- Worm
- Spyware
- Ransomware

2.5 Describe the characteristics of strong passwords and methods of attacking password-protected systems.

Learning outcome
The learner will: 3. Understand the applications of cryptography to ICT systems and data
Assessment criteria
The learner can: 3.1 Describe cryptographic algorithms: • Hashing • Symmetric • Asymmetric 3.2 Describe how cryptography can be applied to ICT system and data security in terms of: • Confidentiality • Integrity • Authentication • Non-repudiation • Access Control 3.3 Explain the operation of Public Key Infrastructure (PKI) 3.4 Explain the concepts of the Key Management and Certificate life cycles.

Unit 041 Systems architecture

UAN:	**T/601/3504**
Level:	3
Credit value:	10
GLH:	80
Aim:	This unit covers how information is represented and processed in a computer, communication processes in networks and distributed systems and distributed applications and transaction processing. It also involves knowledge and use of an operating environment.

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 information in a computer 1.2 Describe the role of input, output and storage devices 1.3 Describe the characteristics of C.P.U. components and the operation of the Fetch Execute Cycle 1.4 Describe the operation of a peripheral device using correct technical terminology.

Learning outcome
The learner will: 2. Make effective use of the operating environment of current computer systems
Assessment criteria
The learner can: 2.1 Use and configure operating system interfaces and functions 2.2 Explain the role of process management and concurrent processes in computer operating systems 2.3 Describe how operating system features can contribute to data and system security.

Learning outcome
The learner will: 3. Know the communication process in distributed operating systems and computer networks
Assessment criteria
The learner can: 3.1 Outline the function and operation of distributed operating systems 3.2 Outline the functions of data communications systems in enabling network and distributed systems.

Learning outcome
The learner will: 4. Know distributed applications and transaction processing in mainframe systems
Assessment criteria
The learner can: 4.1 Outline the operation and functions of mainframe systems 4.2 Outline the evolution of and characteristics of distributed applications 4.3 Outline data and process distribution.

Unit 042 Telecommunications principles

UAN:	**D/601/3254**
Level:	3
Credit value:	10
GLH:	80
Aim:	The aim of this unit is to cover the principles of telecommunications including AC circuits, line impairments and transmissions.

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 • impedance in terms of resistive and reactive components 1.2 Describe the characteristics of series and parallel resonant circuits 1.3 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: • decibel (dB) as a unit of loss • dBm as a unit of power 2.2 Define signal-to-noise ratio as applied to transmission lines 2.3 Calculate using dBs and dBms the: • total loss of a system from individual losses • total loss of a system from input and output signal levels • output signal level from total loss and input signal level • signal-to-noise ratio.

Learning outcome
The learner will: 3. Apply the characteristics of transmission lines
Assessment criteria
The learner can: 3.1 Explain the effect of the primary line constants R, G, L and C on the characteristic impedance of transmission lines 3.2 Define the concept of angular frequency as applied to transmission lines 3.3 Calculate, using the primary line constants, the characteristic impedance of: • finite and infinite line lengths • a parallel pair of wires • co-axial cable 3.4 Produce an equivalent circuit model of a transmission line in terms of resistance, capacitance and inductance 3.5 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 following representations of binary information and explain the advantages of each type: • non-return to zero (NRZ) digital encoding from given values • return to zero (RTZ) digital encoding from given values • bi-phase digital encoding (Manchester) from given values • bi-phase digital encoding (Differential Manchester) from given values 4.2 Explain the concepts of bit rate and bit error rate (BER) 4.3 Explain digital signal impairments in terms of: • delay • jitter • binary errors 4.4 Demonstrate 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 the following methods of digital modulation using analogue frequency carriers: • amplitude shift keying (ASK & OOK) • frequency shift keying (FSK) • phase shift keying (PSK) • bi-polar shift keying (BPSK) • quadra-phase shift keying (QPSK) • quadrature amplitude shift keying (QAM) 5.2 Describe the purpose of, and produce constellation diagrams 5.3 Calculate the practical channel capacity using: • Shannon-Hartley formula ?log2(S/N+1) • Shannon formula 2?log2(n) 5.4 Explain the need for filters and their effect on digitally modulated signals 5.5 Calculate the Baud rate of a given link states using given values.

Learning outcome
The learner will: 6. Be able to apply the process of multiplexing digital and analogue signals over transmission media
Assessment criteria
The learner can: 6.1 Explain the following type of multiplexing: • frequency division • synchronous time division • asynchronous time division • digital time division • code division • wavelength (coarse and dense) division.

Unit 043 Software testing

UAN:	**L/601/3511**
Level:	3
Credit value:	9
GLH:	50
Aim:	This unit introduces the basics of testing strategies and techniques and their application.

Learning outcome
The learner will: 1. Understanding testing strategies and techniques
Assessment criteria
The learner can: 1.1 Explain the purpose and scope of unit, integration and system testing of software 1.2 Describe the stages of system testing including alpha, beta, and acceptance testing 1.3 Describe how automation can be applied to software testing 1.4 Describe and differentiate functional (black box) and structural (white box) testing.

Learning outcome
The learner will: 2. Manage a test process for a software solution
Assessment criteria
The learner can: 2.1 Develop a test plan including: • test specification (including functional and structural techniques) • test cases • test data and expected results • resources and scheduling • recording and checking of results • evaluation 2.2 Implement a test plan 2.3 Produce a test report.

Unit 044 Web development

UAN:	**K/601/3256**
Level:	3
Credit value:	10
GLH:	80
Aim:	This unit provides an understanding of web architecture, components and technologies. It also covers the development of a specification for a website and implementation of website elements.

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 the TCP/IP protocol including IPv6 1.3 Explain the role of internet service providers, web hosting services and domain name registrars 1.4 Describe available types of web functionality including: • Web1.0 • Web 2.0 • Blogs • Online applications • Cloud computing.

Learning outcome
The learner will: 2. Understand the technologies that can be used to built 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: • web runtime environments • 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. Develop a website specification
Assessment criteria
The learner can: 3.1 Produce a pre-production proposal document for a website development project 3.2 Identify the components required to develop a website 3.3 Produce an implementation plan for a website development.

Learning outcome
The learner will: 4. Implement elements of a website
Assessment criteria
The learner can: 4.1 Design components of a website 4.2 Develop components of a website 4.3 Test components of a website.

Unit 045 Advanced data representation and manipulation for IT

UAN:	**F/601/3246**
Level:	3
Credit value:	7
GLH:	60
Aim:	The aim of this unit is to cover the advanced data representation and manipulation for IT purposes to include matrix methods, applying expressions and graph theory.

Learning outcome
The learner will: 1. Be able to 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: • the inverse of a matrix by elementary row operations • the transpose of a matrix 1.6 Apply matrix techniques to a range of applications including: • solving simultaneous linear equations • vector transformation and rotation • maps and graphs.

Learning outcome
The learner will: 2. Be able to 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. Be able to 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 085 Drawing and planning software

UAN:	**F/502/4611**
Level:	3
Credit value:	4
GLH:	30
Aim:	This is the ability to use software designed for producing 2D drawings or plans, such as flowcharts, mindmaps and technical drawings. On completion of this unit a learner should be able to select and use advanced tools and techniques to produce complex and non-routine drawings and plans. 2D drawing and planning software tools and techniques will be described as 'advanced' because: • the software tools and functions used will be complex and at times require new learning, which will involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying; • the inputting, manipulating and outputting techniques will be complex, and will involve research, identification and application; and • the user will take full responsibility for inputting, structuring, editing and presenting the information.

Learning outcome
The learner will: 1. Input, organise and combine information for drawings or plans
Assessment criteria
The learner can: 1.1 Identify what types of shapes and other elements will be needed 1.2 Evaluate templates and explain why and how they need to be changed to meet needs 1.3 Select, adapt, create and use the appropriate shapes to meet needs, including shapes imported from other sources 1.4 Select, adapt, define and create appropriate templates and styles to meet needs 1.5 Provide guidance on what copyright constraints apply to the use of own and others' shapes or other elements 1.6 Combine information for drawings or plans including exporting outcomes to other software 1.7 Store and retrieve drawing files effectively, in line with local guidelines and conventions where available.

Learning outcome
The learner will: 2. Use tools and techniques to edit, manipulate, format and present drawings or plans
Assessment criteria
The learner can: 2.1 Explain what drafting guides to use so that the shapes and other elements are appropriately prepared 2.2 Select and use appropriate software tools to manipulate and edit shapes and other elements with precision 2.3 Select and use appropriate software tools to format shapes and other elements, including applying styles and colour schemes 2.4 Check drawings or plans meet needs, using IT tools and making corrections as necessary 2.5 Identify and respond to quality problems with drawings or plans to make sure they are fit for purpose and meet needs 2.6 Explain what context the drawings and plans will be used in and how this will effect how they are presented 2.7 Select and use appropriate presentation methods and accepted page layouts.

Unit 086 Database software

UAN:	**T/502/4556**
Level:	3
Credit value:	6
GLH:	45
Aim:	This is the ability to use a software application designed to organise and store structured information and generate reports. On completion of this unit a learner should be able to select and use advanced database software tools and techniques efficiently to: • enter complex information into databases; • retrieve information by creating queries using multiple selection criteria; and • produce reports by setting up menus or short cuts. They will also be able to design, create and interrogate multiple-table relational databases. Database tools, functions and techniques will be described as 'advanced' because: • the software tools and functions involved will be complex and at times require new learning, which will involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying; and • the input, manipulation and output techniques involved will be complex, which will involve research, identification and application. Examples of context: Typical 'more complex' reports from multiple-table relational databases may be about – customers' buying methods, order frequency and payment patterns.

Learning outcome
The learner will: 1. Plan, create and modify relational database tables to meet requirements
Assessment criteria
The learner can: 1.1 Explain how a relational database design enables data to be organised and queried 1.2 Plan and create multiple tables for data entry with appropriate fields and properties 1.3 Set up and modify relationships between database tables 1.4 Explain why and how to maintain data integrity 1.5 Respond appropriately to problems with database tables 1.6 Use database tools and techniques to ensure data integrity is maintained.

Learning outcome
The learner will: 2. Enter, edit and organise structured information in a database
Assessment criteria
The learner can: 2.1 Design and create forms to access, enter, edit and organise data in a database 2.2 Select and use appropriate tools and techniques to format data entry forms 2.3 Check data entry meets needs, using IT tools and making corrections as necessary 2.4 Respond appropriately to data entry errors.

Learning outcome
The learner will: 3. Use database software tools to create, edit and run data queries and produce reports
Assessment criteria
The learner can: 3.1 Explain how to select, generate and output information from queries according to requirements 3.2 Create and run database queries to display, amend or calculate selected data 3.3 Plan and produce database reports from a multiple-table relational database 3.4 Select and use appropriate tools and techniques to format database reports 3.5 Check reports meet needs, using IT tools and making corrections as necessary.

Unit 090 Design software

UAN:	**A/502/4574**
Level:	3
Credit value:	5
GLH:	40
Aim:	This is the ability to use a software application designed to create, modify and layout artwork for display in print or on a screen (eg vector graphics for design and drawing; raster graphics for photo manipulation or illustration). On completion of this unit a learner should be able to select and use a wide range of advanced design software tools and techniques to complex and non-routine designs. Design software tools and techniques will be defined as 'advanced' because: • the software tools and functions used will be complex and at times require new learning, which will involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying; • the inputting, manipulating and outputting techniques will be multi-step and complex, and will involve research, identification and application; and • the user will take full responsibility for inputting, structuring, editing and presenting the information. Examples of context: logo for a company or touching up and removing unwanted elements from a photograph.

Learning outcome
The learner will: 1. Obtain, insert and combine information for designs
Assessment criteria
The learner can: 1.1 Explain what designs are needed 1.2 Explain how the context affects the way designs should be prepared 1.3 Provide guidance on what and how any copyright or other constraints may apply to the use of own and others' designs 1.4 Obtain, insert and prepare designs 1.5 Explain how file format affects design quality, format and size and how to choose appropriate formats for saving designs 1.6 Use appropriate techniques to organise and combine information of different types or from different sources 1.7 Store and retrieve files effectively, in line with guidelines and conventions where available.

Learning outcome
The learner will: 2. Use design software tools to create, manipulate and edit designs
Assessment criteria
The learner can: 2.1 Explain what technical factors affecting designs needs to be taken into account and how to do so 2.2 Select and use suitable tools and techniques efficiently to create designs 2.3 Use guidelines and dimensioning tools appropriately to enhance precision 2.4 Select and use appropriate tools and techniques to manipulate and edit designs 2.5 Check designs meet needs, using IT tools and making corrections as necessary 2.6 Identify and respond appropriately to quality problems to ensure that outcomes are fit for purpose and meet needs.

Unit 091 Desktop publishing software

UAN:	**H/502/4567**
Level:	3
Credit value:	5
GLH:	40
Aim:	This is the ability to use desktop publishing software designed to combine and manipulate text, image and graphic elements in layouts appropriate for subsequent publication to screen or print. On completion of this unit a learner should be able to select and use a wide range of advanced desktop publishing software tools and techniques effectively to produce publications that are at times non-routine or unfamiliar. Publication tools and techniques will be described as 'advanced' because: • the software tools and functions used will be complex and at times require new learning, which will involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying; • the inputting, manipulating and outputting techniques will be complex, and will involve • research, identification and application; and • the user will take full responsibility for inputting, structuring, editing and presenting the information. Examples of context: Typical documents may include – an interactive or multi-media publication for the web; multi-page magazine.

Learning outcome
The learner will: 1. Select and use appropriate designs and page layouts for publications
Assessment criteria
The learner can: 1.1 Explain what types of information are needed 1.2 Explain when and how to change page design and layout to increase effectiveness of a publication 1.3 Select, change, define, create and use appropriate page design and layout for publications in line with local guidelines, where relevant 1.4 Select and use appropriate media for the publication.

Learning outcome
The learner will: 2. Input and combine text and other information within publications
Assessment criteria
The learner can: 2.1 Find and input information into a publication so that it is ready for editing and formatting 2.2 Organise and combine information for publications in line with any copyright constraints, including importing information produced using other software 2.3 Provide guidance on how copyright constraints affect use of own and others' information 2.4 Explain which file format to use for saving designs and images 2.5 Store and retrieve publication files effectively, in line with local guidelines and conventions where available.

Learning outcome
The learner will: 3. Use desktop publishing software techniques to edit and format publications
Assessment criteria
The learner can: 3.1 Determine and discuss what styles, colours, font schemes, editing and formatting to use for the publication 3.2 Create styles, colours and font schemes to meet needs 3.3 Select and use appropriate techniques to edit publications and format text 3.4 Manipulate images and graphic elements accurately 3.5 Control text flow within single and multiple columns and pages 3.6 Check publications meet needs, using IT tools and making corrections as necessary 3.7 Identify and respond appropriately to quality problems with publications to ensure that outcomes are fit for purpose and meet needs.

Unit 092 Using email

UAN:	**T/502/4301**
Level:	3
Credit value:	3
GLH:	20
Aim:	This is the ability to make the best use of e-mail software to safely and securely send, receive and store messages. On completion of this unit a learner should be able to help others to make more efficient use of email software tools to send, receive and store messages for complex and non-routine activities. E-mail tools and techniques will be defined as 'advanced' because: • the techniques required will be multi-step and complex, and the selection process may involve research, identification and application; and • the IT tools required will be complex and at times involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying. Examples of context: Set up rules for automatic filtering and responses to incoming messages; create templates for automating email replies

Learning outcome
The learner will: 1. Use email software tools and techniques to compose and send messages
Assessment criteria
The learner can: 1.1 Select and use software tools to compose and format email messages, including attachments 1.2 Explain methods to improve message transmission 1.3 Send email messages to individuals and groups 1.4 Explain why and how to stay safe and respect others when using email 1.5 Use an address book to manage contact information.

Learning outcome
The learner will: 2. Manage use of email software effectively
Assessment criteria
The learner can: 2.1 Develop and communicate guidelines and procedures for using email effectively 2.2 Read and respond appropriately to email messages and attachments 2.3 Use email software tools and techniques to automate responses 2.4 Explain why, how and when to archive messages 2.5 Organise, store and archive email messages effectively 2.6 Customise email software to make it easier to use 2.7 Explain how to minimise email problems 2.8 Respond appropriately to email problems.

Unit 093 Imaging software

UAN:	**R/502/4614**
Level:	3
Credit value:	5
GLH:	40
Aim:	This is the ability to use a software application designed to create, modify and layout images for display in print or on a screen (eg vector graphics for design and drawing; raster graphics for photo manipulation or illustration). On completion of this unit a learner should be able to select and use a wide range of advanced imaging software tools and techniques to complex and non-routine designs. Imaging software tools and techniques will be defined as 'advanced' because: • the software tools and functions used will be complex and at times require new learning, which will involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying; • the inputting, manipulating and outputting techniques will be multi-step and complex, and will involve research, identification and application; and • the user will take full responsibility for inputting, structuring, editing and presenting the information. Examples of context: logo for a company or touching up and removing unwanted elements from a photograph.

Learning outcome
The learner will: 1. Obtain, insert and combine information for images
Assessment criteria
The learner can: 1.1 Explain what images are needed 1.2 Explain how the context affects the way images should be prepared 1.3 Provide guidance on what and how any copyright or other constraints may apply to the use of own and others' images 1.4 Obtain, insert and prepare images 1.5 Explain how file format affects image quality, format and size and how to choose appropriate formats for savings images 1.6 Use appropriate techniques to organise and combine information of different types or from different sources 1.7 Store and retrieve files effectively, in line with guidelines and conventions where available.

Learning outcome
The learner will: 2. Use imaging software tools to create, manipulate and edit images
Assessment criteria
The learner can: 2.1 Explain what technical factors affecting images need to be taken into account and how to do so 2.2 Select and use suitable tools and techniques efficiently to create images 2.3 Use guidelines and dimensioning tools appropriately to enhance precision 2.4 Select and use appropriate tools and techniques to manipulate and edit images 2.5 Check images meet needs, using IT tools and making corrections as necessary 2.6 Identify and respond appropriately to quality problems to ensure that images are fit for purpose and meet needs.

Unit 094 Presentation software

UAN:	**T/502/4623**
Level:	3
Credit value:	6
GLH:	45
Aim:	This is the ability to use software applications to produce effective presentations, which include a combination of media (eg images, animation and sound) for education, entertainment or information sharing. On completion of this unit a learner should be able to select and use a wide range of advanced presentation software tools and techniques effectively to produce presentations that are complex or non-routine. Presentation tools and techniques will be described as 'advanced' because: • the software tools and functions used will be complex and at times require new learning, which will involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying; • the inputting, manipulating and outputting techniques will be complex, and will involve research, identification and application; and • the user will take full responsibility for inputting, structuring, editing and presenting the information. Examples of context: An interactive or multi-media presentation.

Learning outcome
The learner will: 1. Input and combine text and other information within presentation slides
Assessment criteria
The learner can: 1.1 Explain what types of information are required for the presentation 1.2 Enter text and other information using layouts appropriate to type of information 1.3 Insert charts and tables and link to source data 1.4 Insert images, video or sound to enhance the presentation 1.5 Identify any constraints which may affect the presentation 1.6 Organise and combine information for presentations in line with any constraints 1.7 Store and retrieve presentation files effectively, in line with local guidelines and conventions where available.

Learning outcome
The learner will: 2. Use presentation software tools to structure, edit and format presentations
Assessment criteria
The learner can: 2.1 Explain when and how to use and change slide structure and themes to enhance presentations 2.2 Create, amend and use appropriate templates and themes for slides 2.3 Explain how interactive and presentation effects can be used to aid meaning or impact 2.4 Select and use appropriate techniques to edit and format presentations to meet needs 2.5 Create and use interactive elements to enhance presentations 2.6 Select and use animation and transition techniques appropriately to enhance presentations.

Learning outcome
The learner will: 3. Prepare interactive slideshow for presentation
Assessment criteria
The learner can: 3.1 Explain how to present slides to communicate effectively for different contexts 3.2 Prepare interactive slideshow and associated products for presentation 3.3 Check presentation meets needs, using IT tools and making corrections as necessary 3.4 Evaluate presentations, identify any quality problems and discuss how to respond to them 3.5 Respond appropriately to quality problems to ensure that presentations meet needs and are fit for purpose.

Unit 095 Spreadsheet software

UAN:	**J/502/4626**
Level:	3
Credit value:	6
GLH:	45
Aim:	This is the ability to use a software application designed to record data in rows and columns, perform calculations with numerical data and present information using charts and graphs. On completion of this unit a learner should be able to select and use a wide range of advanced spreadsheet software tools and techniques to produce, present and check complex and non-routine spreadsheets. Spreadsheet software tools and techniques will be defined as 'advanced' because: • the range of data entry, manipulation and outputting techniques will be complex and non-routine; • the tools, formulas and functions needed to analyse and interpret the required information require complex and non-routine knowledge and understanding (for example, data restrictions, data validation using formula, pivot tables, data maps); and • the user will take full responsibility for setting up and developing the functionality of the spreadsheet. Examples of context: Typical examples may include - cost benefit analysis, analysis of results from a questionnaire or survey, developing summary reports from a large data set, creating a personalised customer quotation from a standard price list.

Learning outcome
The learner will: 1. Use a spreadsheet to enter, edit and organise numerical and other data
Assessment criteria
The learner can: 1.1 Identify what numerical and other information is needed in the spreadsheet and how it should be structured 1.2 Enter and edit numerical and other data accurately 1.3 Combine and link data from different sources 1.4 Store and retrieve spreadsheet files effectively, in line with local guidelines and conventions where available.

Learning outcome
The learner will: 2. Select and use appropriate formulas and data analysis tools and techniques to meet requirements
Assessment criteria
The learner can: 2.1 Explain what methods can be used to summarise, analyse and interpret spreadsheet data and when to use them 2.2 Select and use a wide range of appropriate functions and formulas to meet calculation requirements 2.3 Select and use a range of tools and techniques to analyse and interpret data to meet requirements 2.4 Select and use forecasting tools and techniques.

Learning outcome
The learner will: 3. Use tools and techniques to present, and format and publish spreadsheet information
Assessment criteria
The learner can: 3.1 Explain how to present and format spreadsheet information effectively to meet needs 3.2 Select and use appropriate tools and techniques to format spreadsheet cells, rows, columns and worksheets effectively 3.3 Select and use appropriate tools and techniques to generate, develop and format charts and graphs 3.4 Select and use appropriate page layout to present, print and publish spreadsheet information 3.5 Explain how to find and sort out any errors in formulas 3.6 Check spreadsheet information meets needs, using IT tools and making corrections as necessary 3.7 Use auditing tools to identify and respond appropriately to any problems with spreadsheets.

Unit 096 Word processing software

UAN:	**Y/502/4629**
Level:	3
Credit value:	6
GLH:	45
Aim:	This is the ability to use a software application designed for the creation, editing and production of largely text-based documents. On completion of this unit a learner should be able to select and use a range of advanced word processing software tools and techniques to produce complex and non-routine documents. Word processing tools and techniques will be described as 'advanced' because: the software tools and functions will be complex and at times require new learning, which will involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying; • the techniques required will be complex, and the process of selecting appropriate techniques may involve research, identification and application; and • the user will take full responsibility for the inputting, manipulating and outputting of the information. Examples of context: Typical documents will require problem solving and creative thinking and may include – complex reports and content for publications such as web pages, journals, newsletters or other printed materials.

Learning outcome
The learner will: 1. Enter and combine text and other information accurately within word processing documents
Assessment criteria
The learner can: 1.1 Summarise what types of information are needed for the document and how they should be linked or integrated 1.2 Use appropriate techniques to enter text and other types of information accurately and efficiently 1.3 Create, use and modify appropriate templates for different types of documents 1.4 Explain how to combine and merge information from other software or multiple documents 1.5 Combine and merge information within a document from a range of sources 1.6 Store and retrieve document and associated files effectively, in line with local guidelines and conventions where available 1.7 Select and use tools and techniques to work with multiple documents or users 1.8 Customise interface to meet needs.

Learning outcome
The learner will: 2. Create and modify appropriate layouts, structures and styles for word processing documents
Assessment criteria
The learner can: 2.1 Analyse and explain the requirements for structure and style 2.2 Create, use and modify columns, tables and forms to organise information 2.3 Define and modify styles for document elements 2.4 Select and use tools and techniques to organise and structure long documents.

Learning outcome
The learner will: 3. Use word processing software tools and techniques to format and present documents effectively to meet requirements
Assessment criteria
The learner can: 3.1 Explain how the information should be formatted to aid meaning 3.2 Select and use appropriate techniques to format characters and paragraphs 3.3 Select and use appropriate page and section layouts to present and print multi-page and multi-section documents 3.4 Check documents meet needs, using IT tools and making corrections as necessary 3.5 Evaluate the quality of the documents produced to ensure they are fit for purpose 3.6 Respond appropriately to any quality problems with documents to ensure that outcomes meet needs and are fit for purpose.

Unit 097 Website software

UAN:	**Y/502/4632**
Level:	3
Credit value:	5
GLH:	40
Aim:	This is the ability to use a software application designed for planning, designing and building websites. On completion of this unit a learner should be able to use basic website software tools and techniques appropriately to produce straightforward or routine single web pages from pre-set templates. Website software tools and techniques will be defined as 'basic' because: • the software tools and functions involved will be predefined or commonly used; • the range of inputting, manipulation and outputting techniques are straightforward or routine; • and • the template used for the content will be predetermined or familiar. Examples of context: Personal webpage or blog created in social networking, learning or auction site; information pages created within web or content management system.

Learning outcome
The learner will: 1. Create structures and styles and use them to produce websites
Assessment criteria
The learner can: 1.1 Determine what website content and layout will be needed for each page and for the site 1.2 Plan and create web page templates to layout content 1.3 Select and use website features and structures to enhance website navigation and functionality 1.4 Create, select and use styles to enhance website consistency and readability 1.5 Provide guidance on laws, guidelines and constraints that affect the content and use of websites

1.6 Explain what access issues may need to be taken into account 1.7 Explain when and why to use different file types for saving content 1.8 Store and retrieve files effectively, in line with local guidelines and conventions where available.

Learning outcome
The learner will: 2. Select and use website software tools and features to develop multiple page websites with multimedia and interactive features
Assessment criteria
The learner can: 2.1 Prepare content for web pages so that it is ready for editing and formatting 2.2 Organise and combine information needed for web pages in line with any copyright constraints, including across different software 2.3 Select and use appropriate editing and formatting techniques to aid meaning 2.4 Select and use appropriate programming and development techniques to add features and enhance websites 2.5 Select and use file formats that make information easier to download 2.6 Check web pages meet needs, using IT tools and making corrections as necessary.

Learning outcome
The learner will: 3. Publish and test multiple page websites with multimedia and interactive features
Assessment criteria
The learner can: 3.1 Select and use appropriate testing methods to check that all elements and features of complex websites are working as planned 3.2 Identify any quality problems with websites and explain how to respond to them 3.3 Select and use an appropriate programme to upload and publish the website and make sure that it will download efficiently 3.4 Respond appropriately to quality problems with websites to ensure outcomes are fit for purpose.

Unit 098 Multimedia software

UAN:	**H/502/4617**
Level:	3
Credit value:	6
GLH:	45
Aim:	This is the ability to use multimedia software designed to combine, manipulate and animate a variety of objects and data types in layouts appropriate for subsequent production to screen. In general, multimedia includes a combination of text, audio, still images, animation, video, and interactive content. On completion of this unit a learner should be able to select and use a wide range of advanced multimedia tools and techniques effectively to produce publications that are at times non-routine or unfamiliar. Publication tools and techniques will be described as 'advanced' because: • the software tools and functions used will be complex and at times require new learning, which will involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying; • the inputting, manipulating and outputting techniques will be complex, and will involve • research, identification and application; and • the user will take full responsibility for inputting, structuring, editing and presenting the information.

Learning outcome
The learner will: 1. Plan the content and organisation of multimedia products to meet needs
Assessment criteria
The learner can: 1.1 Select and use appropriate techniques to plan and communicate the content, design and layout of multimedia outcomes 1.2 Plan the use of interactive features, transitions and effects to meet needs 1.3 Explain the type of multimedia outcome needed and the specification that it must meet 1.4 Develop the design layout for multimedia outcomes 1.5 Explain how the different elements of the content will relate and what elements of the content will be interactive 1.6 Summarise how copyright and other constraints affect use of own and others' information.

Learning outcome
The learner will: 2. Obtain, input and combine content to build multimedia outcomes
Assessment criteria
The learner can: 2.1 Select and use an appropriate combination of input device, software and input techniques to obtain and input the relevant content 2.2 Combine information of different types or from different sources for multimedia outcomes 2.3 Select and use appropriate software to write and compress multimedia files 2.4 Store and retrieve multimedia files effectively, in line with local guidelines and conventions where available 2.5 Explain when and why to use different file formats and file compression for saving multimedia files.

Learning outcome
The learner will: 3. Use tools and techniques to build and edit multimedia content
Assessment criteria
The learner can: 3.1 Select and use appropriate techniques to edit and format multimedia outcomes 3.2 Manipulate images and graphic elements accurately 3.3 Check multimedia outcomes meet needs, using IT tools and making corrections as necessary 3.4 Identify and respond appropriately to quality problems to ensure that outcomes are fit for purpose and meet needs.

Learning outcome
The learner will: 4. Play and present multimedia outcomes
Assessment criteria
The learner can: 4.1 Explain what combination of display device and software to use that will overcome any constraints there may be in displaying different multimedia file formats 4.2 Select and use appropriate software to optimise the display of multimedia outcomes and maximise impact 4.3 Select and adjust the display settings to exploit the features of the display device and optimise the quality of the presentation.

Unit 099 Using the Internet

UAN:	**F/502/4298**
Level:	3
Credit value:	5
GLH:	40
Aim:	This is the ability to set up and use appropriate connection methods to access the Internet; make the best use of browser software tools and techniques to search for, retrieve and exchange information using a browser or public search engine, and work safely and securely online. On completion of this unit a learner should be able to advise on and set up an Internet connection to meet a variety of user needs. They can also make efficient use of advanced Internet software tools and techniques to search for and exchange information for complex and non-routine activities. Internet tools and techniques will be defined as 'advanced' because: • the software tools and functions required will be described as complex because at times they involve having the idea that there may be a tool or function to do something (eg improve efficiency or create an effect), exploring technical support, self-teaching and applying; and • the range of techniques required for searching and exchanging information will be complex, and the selection process may involve research, identification and application. Examples of context: Setting up an Internet connection for use by others; developing and promoting organisational guidelines and procedures for Internet safety; setting up and moderating the content of a discussion forum.

Learning outcome
The learner will: 1. Select and set up an appropriate connection to access the Internet
Assessment criteria
The learner can: 1.1 Identify different types of connection methods that can be used to access the Internet 1.2 Explain the benefits and drawbacks of different connection methods 1.3 Analyse the issues affecting different groups of users 1.4 Select and set up an Internet connection using an appropriate combination of hardware and software 1.5 Recommend a connection method for Internet access to meet identified needs 1.6 Diagnose and solve Internet connection problems.

Learning outcome
The learner will: 2. Set up and use browser software to navigate webpages
Assessment criteria
The learner can: 2.1 Select and use browser tools to navigate webpages effectively 2.2 Explain when to change browser settings to aid navigation 2.3 Adjust and monitor browser settings to maintain and improve performance 2.4 Explain when and how to improve browser performance 2.5 Customise browser software to make it easier to use.

Learning outcome
The learner will: 3. Use browser tools to search effectively and efficiently for information from the Internet
Assessment criteria
The learner can: 3.1 Select and use appropriate search techniques to locate information efficiently 3.2 Evaluate how well information meets requirements 3.3 Manage and use references to make it easier to find information another time 3.4 Download, organise and store different types of information from the Internet.

Learning outcome
The learner will: 4. Use browser software to communicate information online
Assessment criteria
The learner can: 4.1 Identify and analyse opportunities to create, post or publish material to websites 4.2 Select and use appropriate tools and techniques to communicate information online 4.3 Share and submit information online using appropriate language and moderate content from others.

Learning outcome
The learner will: 5. Develop and apply appropriate safety and security practices and procedures when working online
Assessment criteria
The learner can: 5.1 Explain the threats to system performance when working online 5.2 Work responsibly and take appropriate safety and security precautions when working online 5.3 Explain the threats to information security and integrity when working online 5.4 Keep information secure and manage user access to online sources securely 5.5 Explain the threats to user safety when working online 5.6 Explain how to minimise internet security risks 5.7 Develop and promote laws, guidelines and procedures for safe and secure use of the Internet.

Unit 321 Testing ICT systems

UAN:	**R/501/3998**
Level:	3
Credit value:	11
GLH:	60
Aim:	This unit will enable the learner to plan, select and implement IT system tests. By the end of the unit, learners will be able to devise standard testing procedures for stand-alone and networked systems using existing test hardware and software; they will also be able to select and apply test procedures for particular situations, compare the results with benchmarks and make recommendations for further action. N.B**.** The centre will be required to provide the learner with documentation specific to the system being used for training, in order that the learner can make realistic decisions to include in the software installation plans (see outcomes 1.1. and 2.3).

Learning outcome
The learner will: 1. Plan and produce standard testing procedures
Assessment criteria
The learner can: 1.1 use manufacturer's test and product information (supplied by trainer and/or downloaded from the Internet) to devise test plans for systems and equipment 1.2 determine acceptable tolerances for test results to indicate serviceable and faulty components in systems 1.3 produce a standard test plan to include, expected results and conclusions, fault diagnosis guidance 1.4 describe the benefits of effective standard testing procedures, eg effects on labour costs, materials costs, system down time, reliability 1.5 describe the main features of a testing plan 1.6 explain the importance of discussing the testing plan with the customer.

Learning outcome
The learner will: 2. Select tests and determine expected results

Assessment criteria
The learner can: 2.1 identify and record details of system hardware and software configuration settings 2.2 clarify the nature of any known problems by discussion with the user 2.3 identify a test plan (supplied by trainer) that will enable a diagnosis to be made 2.4 describe methods and procedures for identifying system hardware, software and configuration settings 2.5 identify common sources of information for system hardware and software 2.6 state the main characteristics of typical system hardware and software.

Learning outcome
The learner will: 3. Identify and manage consequences of testing
Assessment criteria
The learner can: 3.1 identify tests which may affect system data, software and configuration by consulting 3.2 backup and restore system software 3.3 record and reinstate system configuration and hardware settings 3.4 record and reinstate user settings and customisations 3.5 identify tests with possible adverse consequences 3.6 describe the effects of tests with possible adverse consequences 3.7 describe typical actions to be taken to avoid adverse consequences of tests.

Learning outcome
The learner will: 4. Apply tests and analyse results
Assessment criteria
The learner can: 4.1 use diagnostic and testing software including vendor supplied, third party and operating system utilities 4.2 use functions of anti-virus and anti-spyware utilities 4.3 use test equipment, hardware and accessories 4.4 implement tests 4.5 compare actual test results with expected results 4.6 draw conclusions from test results and disseminate information 4.7 describe the purpose and function of commonly available testing hardware and software 4.8 describe when and where to use different types of diagnostic hardware and software 4.9 describe how to draw conclusions from actual and expected test results, based on a comprehensive knowledge of system characteristics and performance.

Unit 328 Maintain ICT equipment and systems

UAN:	**R/501/4004**
Level:	3
Credit value:	12
GLH:	60
Aim:	This unit will enable the candidate to maintain ICT networks and multi-user systems.

Learning outcome
The learner will: 1. Identify types of system maintenance
Assessment criteria
The learner can: 1.1 prepare a system maintenance plan for peer to peer and client server 1.2 identify types of system maintenance 1.3 describe the properties of different types of maintenance 1.4 describe the key activities in each type of maintenance and their benefits 1.5 describe types of remote maintenance 1.6 describe the importance of negotiating system priorities and availability with customers.

Learning outcome
The learner will: 2. Collect information on technical problems with ICT systems
Assessment criteria
The learner can: 2.1 obtain information to resolve technical problems with ICT systems 2.2 select and justify the test to be undertaken for a given problem, ensuring the tests are applied correctly 2.3 create and maintain operational records 2.4 describe the information needed to resolve technical problems with ICT systems 2.5 identify the most common types of technical problems that could occur in ICT systems 2.6 identify the most common routine maintenance procedures.

Learning outcome
The learner will: 3. Evaluate technical problems and implement solutions
Assessment criteria
The learner can: 3.1 apply preventative maintenance using the recommended procedures, materials and parts 3.2 maintain different types of hardware 3.3 maintain function of hardware by applying software fixes 3.4 check the equipment to confirm that the preventative maintenance procedures have been carried out successfully 3.5 produce a report of problems encountered while carrying out preventative maintenance 3.6 maintain preventative maintenance records.

Unit 355 Designing and creating advanced websites

UAN:	**K/501/4008**
Level:	3
Credit value:	16
GLH:	70
Aim:	The aim of this unit is to provide candidates with an advanced understanding of some of the more complex parts of creating a professional business website, it allows them to competently and professionally add elements to sites that will make them easier for function and maintain. Candidates will develop a more in depth understanding of advanced website design and maintenance and the operating system as well as the ability to work in a supervisory role performing advanced tasks with high degree of competence, using problem solving skills and giving direction to others.

Learning outcome
The learner will: 1. Explain the fundamentals of advanced web page development
Assessment criteria
The learner can: 1.1 describe how web pages can be made more interactive (using eg: VRML, DHTML and Java applets) 1.2 explain the purposes of XML 1.3 outline the different uses of scripting languages (eg: CGI, VB Script, JavaScript) 1.4 explain scripting techniques used to interface a web page with a database to enable the presentation or interchange of up-to-date information.

Learning outcome
The learner will: 2. Undertake formal user requirements analyses
Assessment criteria
The learner can: 2.1 create 'Terms of Reference' for clients to include, a statement of the requirement, a design for the web page using a suitable methodology 2.2 produce project plans for the incremental development of web pages including the gathering of suitable resources and timeframes including where appropriate the use of other people. 2.3 explain the relevance, importance and contents of a 'Terms of Reference', when creating a web page for a third party 2.4 recognise the different components of a Terms of Reference 2.5 explain the importance of a design style sheet when working either to a specification or within a team environment 2.6 describe the constraints and limitations that must be considered when producing a web page.

Learning outcome
The learner will: 3. Use appropriate development tools to implement and test interactive web pages incorporating advanced design and information presentation techniques
Assessment criteria
The learner can: 3.1 create web sites compatible with a range of browsers: • providing both a frame based and a non- frame based interface • incorporate JavaScript into a web page to achieve effects eg: o scrolling text o rollover button graphics • incorporate a Java applet into a web page (eg: expanding menu tree) • using Dynamic HTML to enhance the interactivity or appeal of a web page eg o layers o cascading style sheets (CSS) • interfacing a web page to a database in order to provide a web page presentation of responses to a simple query, eg: o a telephone number linked to a name o a product price or quantity in stock from a product code o library book availability • incorporating into web pages suitable forms to enable the gathering of feedback or other information from users of web pages

3.2 test web sites:
- verifying all links work
- using different browsers to preview pages and verify all components appear as expected

3.3 explain the importance of maintaining cross-browser compatibility

3.4 describe the advantages and disadvantages of a frame based interface

3.5 select appropriate data to be collected using a form

3.6 describe the terms quality, timeliness and accuracy when applied to data collected from a web site.

Learning outcome
The learner will: 4. Use graphics applications to create and manipulate images
Assessment criteria
The learner can: 4.1 create images to predefined specifications (pixel height/width; colour depth) suitable for inclusion in web pages eg: buttons used for linking 4.2 apply transparency to images 4.3 create animated GIFs for use within web pages 4.4 explain the factors that affect the dimensions of a button, for example: • quantity of text • font type, size and style • size and style of applied border • available space for the button(s) on a web page 4.5 describe what is meant by the term anti-aliasing.

Learning outcome
The learner will: 5. Maintain and evaluate web sites
Assessment criteria
The learner can: 5.1 use a website application to manage the development of websites 5.2 publish (upload) websites to local or remote location Internet/intranet 5.3 create appropriate plans for the effective periodic maintenance and updating of web sites 5.4 check that a web site satisfies the 'Terms of Reference' 5.5 identify potential future enhancements to web sites 5.6 create suitable documentation for maintaining web sites to include, for each web page, a list of resources including the full path to a file name from a root directory of a web site 5.7 the importance of documentation in maintaining a web site

5.8 uploading content to web page template by eg

- copy and paste into template on www
- FTP
- size considerations
- speed considerations

5.9 what laws and guidelines affect day-to-day use of IT regarding content, eg

- equal opportunities
    - eg children, race, disability
    - language eg symbol use instead of just text
    - eg visually impaired
- copyright, copy left, open source, GNU, data protection
- security
- guidelines set by employer or organisation.

Unit 356 Design and maintain ICT networks software components

UAN:	**J/501/4002**
Level:	3
Credit value:	11
GLH:	70
Aim:	The aim of this unit is to enable learners to develop the skills to specify data communication protocols and design and maintain network software components for different types of networks.

Learning outcome
The learner will: 1. Be able to explain network concepts
Assessment criteria
The learner can: 1.1 interpret node and routing diagrams 1.2 describe common terms and their advantages and disadvantages 1.3 explain the difference between different network types and topologies 1.4 identify the main: • hardware components of a network • functions of the Network Operating System • functions of network connections 1.5 describe the role of various types of print server and the network printing process including device drivers 1.6 explain the software security requirements when connecting a LAN to an external network and transmitting data 1.7 explain the difference between centralised and distributed networks 1.8 describe common error detection methods 1.9 explain fixed routing techniques.

Learning outcome
The learner will: 2. Describe communication protocols
Assessment criteria
The learner can: 2.1 interpret data communication protocol specifications 2.2 identify and describe ASCII character codes used in data communication protocols 2.3 describe the most common data transmission formats 2.4 explain the purpose and use of different protocol parameters 2.5 describe the importance of using international standards for data communications and the function of each of the OSI layers 2.6 describe the function and construction of data packets in a network, how they are handled in OSI layers and advantages of using packets to transmit data over a network 2.7 describe the functions of protocols and how they are handled in the OSI layered structure 2.8 describe and compare the TCP and UDP 2.9 explain the operation of a token ring with reference to protocols, token passing and packets 2.10 explain the operation of a bus network with reference to protocols, collision detection and packets.

Learning outcome
The learner will: 3. Describe software design concepts for networks
Assessment criteria
The learner can: 3.1 list the factors that make data communications software different from other software 3.2 explain why data communications software is used 3.3 list the message accountability actions to be performed for incoming and outgoing data transmissions 3.4 explain why networks must be tested.

Learning outcome
The learner will: 4. Be able to explain protocol specification methods
Assessment criteria
The learner can: 4.1 interpret: • a State Transition Diagram (STD) • an Event-state table • a program design language.

Learning outcome
The learner will: 5. Design software components
Assessment criteria
The learner can: 5.1 produce diagrams for a given specification 5.2 produce program design language algorithms for software components 5.3 identify: • variable names and data types • argument names and data types • return values and data types 5.4 verify that the design conforms to the specification.

Unit 357 Design and plan for an internal network cabling infrastructure

UAN:	**T/501/4013**
Level:	3
Credit value:	10
GLH:	65
Aim:	This unit will provide the learner with the basic principles needed to plan an underground cable route. Learners will be able to develop an understanding of how internal or campus communications infrastructure is specified, planned and provided

Learning outcome
The learner will: 1. Know how to survey a site for the provision of an internal network cabling infrastructure
Assessment criteria
The learner can: 1.1 identify a range of data, equipment and tools required for an internal and external site survey 1.2 identify the hazards and environments constraints that could apply to the systems and equipment to be provided 1.3 work safely during a site survey 1.4 describe what actions could be taken when variations are identified between the survey findings and site records and plans 1.5 explain why it is important to accurately record survey findings.

Learning outcome
The learner will: 2. Survey a site for the provision of an internal network cabling infrastructure
Assessment criteria
The learner can: 2.1 identify the areas, systems, equipment and full range of data required for a survey from the planning request 2.2 collect and record data and obtain plans and records of the areas to be surveyed and interpret them.

Learning outcome
The learner will: 3. Identify a range of options for the provision of an internal network cabling infrastructure and select the optimum solution
Assessment criteria
The learner can: 3.1 consider viable options and, explain why it is important to: • consider forecasts for both existing and proposed services • consider the implications of existing and planned systems, equipment, support systems and new accommodation • keep abreast of new and emerging technologies • objectively evaluate information, compare and rank different options according to their relative merits • cost options over the lifetime of the equipment or an accepted period 3.2 identify the capabilities of the communications system being planned 3.3 describe the basic principles of risk, cost benefit and sensitivity analysis when considering options 3.4 identify what details are critical to decision makers with regards to the proposed solution 3.5 explain what action could be taken when their authority limit has been exceeded.

Learning outcome
The learner will: 4. Produce schematic designs and detailed plans for the provision of an internal network cabling infrastructure
Assessment criteria
The learner can: 4.1 gather sufficient information to be able to identify future demands for: existing communications services, new communications services 4.2 plan the collection of the information in a timescale suitable for achieving the forecast future demand 4.3 evaluate the information objectively, and use it to identify a range of options 4.4 calculate the broad costs of the options 4.5 select and document the optimum solution in sufficient detail to meet the requirements of the customer 4.6 obtain authority to proceed 4.7 process the selected option to meet agreed timescale for the delivery of the requirements.

Learning outcome
The learner will: 5. Co-ordinate the provision of an internal network cabling infrastructure
Assessment criteria
The learner can: 5.1 identify the work activities to be scheduled and agree the resources available to undertake the work 5.2 obtain details of the work activities to enable the development of a realistic works programme 5.3 schedule the works packages taking into account: • their required timescale • the availability of resources • the inter-dependency of work activities 5.4 allocate work so that it will: • enable the effective and efficient use of resources • take account of team and individual competencies

Unit 358 Design and plan for an external overhead network cabling infrastructure

UAN:	**M/501/4012**
Level:	3
Credit value:	11
GLH:	65
Aim:	This unit will provide the learner with the basic principles needed to plan an external overhead cable route. Learners will be able to develop an understanding of how an external overhead communications infrastructure is specified, planned and provided.

Learning outcome
The learner will: 1. Know how to survey a site for the provision of an external overhead telecoms infrastructure
Assessment criteria
The learner can: 1.1 Identify a range of data, equipment and tools necessary for an external overhead infrastructure site survey 1.2 Identify the hazards and environmental constraints that may be identified during a site survey 1.3 Give examples of health and safety issues that could apply during a site survey and explain how they may be resolved 1.4 Describe what actions could be taken when variations are identified between the survey findings and site records and plans 1.5 Explain why it is important to record accurately the findings of the survey.

Learning outcome
The learner will: 2. Survey a site for the provision of an external overhead telecoms infrastructure
Assessment criteria
The learner can: 2.1 Identify the areas and systems and equipment required to be surveyed from the planning request 2.2 Identify the full range of data required from the survey 2.3 Obtain plans and records of the areas to be surveyed and interpret them 2.4 Collect and record the data required from the survey 2.5 Record details that may affect the planning options.

Learning outcome
The learner will: 3. Know how to produce preliminary designs for the provision of an external overhead communications cabling infrastructure and select an optimum solution
Assessment criteria
The learner can: 3.1 Explain why it is important to consider: • forecasts for both existing and proposed services when considering viable options • the implications of existing and already planned systems and equipment, support systems and accommodation when evaluating options 3.2 Explain why it is important to: • keep abreast of new and emerging technologies • evaluate information objectively and without bias to identify viable options • cost options over the lifetime of the equipment or an accepted period • evaluate, compare and rank different options according to their relative merits 3.3 Describe how to confirm the accuracy, currency and reliability of forecast information 3.4 Describe the basic principles of risk, cost benefit and sensitivity analysis when considering options. 3.5 Identify the capabilities of the communications system being planned and what details are critical to decision makers with regards to the proposed solution.

Learning outcome
The learner will: 4. Produce preliminary designs for the provision of an external overhead Communications cabling infrastructure and select an optimum solution
Assessment criteria
The learner can: 4.1 Gather sufficient information to be able to identify future demands for: • existing communications services • proposed new communications services 4.2 Plan the collection of the information in a timescale suitable for achieving the forecast future demand 4.3 Evaluate the information objectively, and use it to identify a range of options 4.4 Calculate the budget for the options 4.5 Select and document the optimum solution in sufficient detail to meet the requirements of the customer 4.6 Obtain authority to proceed.

Learning outcome
The learner will: 5. Know how to produce a design for the provision of an external overhead communications cabling infrastructure
Assessment criteria
The learner can: 5.1 Describe and give examples of the different types of telecoms systems 5.2 Identify and explain the: • constraints and limitations of an external overhead communications infrastructure • operational and environment requirements of a permanent overhead communications infrastructure 5.3 Explain why it is important to confirm the currency and reliability of information 5.4 Describe how to translate specified communications requirements into realistic and practical designs 5.5 Explain where to find information on new and emerging technologies; relevant to component supply 5.6 Know the legislation and regulations that governing the provision of an external overhead communications cabling infrastructure.

Learning outcome
The learner will: 6. Produce a design for the provision of an external overhead communications cabling infrastructure
Assessment criteria
The learner can: 6.1 Carry out and document a detailed survey on the selected optimum route 6.2 Produce designs for an external overhead cabling infrastructure based on the optimum route 6.3 Use design tools that are suitable for the purpose 6.4 Identify components for the communications systems 6.5 Specify the quantities of components taking into account: existing and already planned plant and services, present and predictable future requirements, design requirements 6.6 Specify a route.

Unit 359 Design and plan for an external underground network cabling infrastructure

UAN:	**F/501/4015**
Level:	3
Credit value:	11
GLH:	65
Aim:	This unit will provide the learner with the basic principles needed to plan an external underground cable route. Learners will be able to develop an understanding of how external underground communications infrastructures are specified, planned and provided.

Learning outcome
The learner will: 1. Know how to do a preliminary site survey for the provision of an external underground communications infrastructure
Assessment criteria
The learner can: 1.1 Identify a range of data, equipment and tools required to carry out an external underground infrastructure site survey 1.2 Describe the hazards and environmental constraints that may be identified during a site survey for a proposed route 1.3 Know the health and safety issues that could apply during a site survey and explain how they may be resolved 1.4 Explain why it is important to record accurately the findings of the survey 1.5 Take action when variations are identified between the survey findings and site records and plans.

Learning outcome
The learner will: 2. Survey a site for the provision of an external underground communications cabling infrastructure
Assessment criteria
The learner can: 2.1 Identify the areas and systems and equipment required to be surveyed from the planning request 2.2 Identify the full range of data required from the survey 2.3 Obtain plans and records of the areas to be surveyed and interpret them 2.4 Collect and record the data required from the survey 2.5 Record details that may affect the planning options.

Learning outcome
The learner will: 3. Know how to produce preliminary designs for the provision of an external underground communications cabling infrastructure and select an optimum solution
Assessment criteria
The learner can: 3.1 Explain why it is important to: • consider forecasts for both existing and proposed services when considering viable options • the implications of existing and already planned systems and equipment, support systems and accommodation when considering options • keep abreast of new and emerging technologies • evaluate information objectively and without bias to identify viable options • cost options over the lifetime of the equipment over an accepted period • evaluate, compare and rank different options according to their relative merits 3.2 Confirm the accuracy, currency and reliability of forecast information 3.3 Describe the basic principles of risk, cost benefit and sensitivity analysis when considering options 3.4 Identify what details are critical to decision makers with regards to the proposed solution and the capabilities of the communications infrastructure being planned.

Learning outcome
The learner will: 4. Produce preliminary designs for the provision of an external underground Communications cabling infrastructure and select an optimum solution
Assessment criteria
The learner can: 4.1 Gather sufficient information to identify future demands for: existing and/or proposed new communications services 4.2 Plan the collection of the information in a timescale suitable for achieving the forecast future demand 4.3 Evaluate the information objectively, and use it to identify a range of options 4.4 Calculate the budget for the options 4.5 Select and document the optimum solution in sufficient detail to meet the requirements of the customer 4.6 Obtain authority to proceed.

Learning outcome
The learner will: 5. Produce a design for the provision of an external underground communications cabling infrastructure
Assessment criteria
The learner can: 5.1 Identify and explain the constraints and limitations, including operational and environmental requirements, of a permanent underground communications infrastructure 5.2 Explain why it is important to confirm the currency and reliability of information 5.3 Translate specified communications requirements into realistic and practical designs 5.4 Explain where to find component supp information on new and emerging technologies 5.5 Identify legislation and regulations that governing the provision of an external underground communications cabling infrastructure.

Learning outcome
The learner will: 6. Plan and produce a design for the provision of an external underground communications cabling infrastructure
Assessment criteria
The learner can: 6.1 Carry out and document a detailed survey on the selected optimum route 6.2 Produce designs for an external underground cabling infrastructure based on the selected optimum route 6.3 Use design tools that are suitable for the purpose 6.4 Identify and document components for the communications systems 6.5 Specify the quantities of components taking into account: existing and already planned plant and services, present and predictable future requirements, design requirements.

Unit 361 Install, configure and integrate networked hardware and software

UAN:	**J/501/3996**
Level:	3
Credit value:	9
GLH:	90
Aim:	This unit will enable the candidate to install, integrate and configure ICT components and networks.

Learning outcome
The learner will: 1. Carry out a risk assessment and ensure health and safety procedures are followed
Assessment criteria
The learner can: 1.1 carry out a risk assessment of the work area relating to ICT 1.2 maintain health and safety records and documentation 1.3 identify areas of the working environment that do not comply with statutory regulations 1.4 make recommendations for changes to procedures and policies in the working environment.

Underpinning knowledge
The learner will: 1. describe employers and employees duties as required by relevant health and safety legislation 2. explain the reasons for keeping health and safety records 3. describe effective methods for monitoring activities and understanding of others in health and safety 4. explain why it is important that people have up to date information about applicable health and safety procedures, and understand their responsibilities 5. describe effective methods of communicating health and safety procedures, eg • oral • written • electronic 6. describe how risks may result from a variety of hazards, eg • the use of hazardous substances

- the use and maintenance of plant, equipment and materials
- poor working practices
- unsafe behaviour
- accidental breakage and spillage
- obstructions
- poor personal health

7. describe how risks are categorised
8. explain the benefits of risk assessment
9. explain the reasons why working practices that contravene statutory regulations should be reported promptly and who they should be reported to
10. describe the importance of reporting 'near misses' and initiating corrective action.

Learning outcome
The learner will: 2. Survey the user environment for installation of hardware equipment and systems
Assessment criteria
The learner can: 2.1 prepare a site survey checklist for the installation of hardware equipment/systems, eg • identify factors which might affect installation • identify potential problems 2.2 plan access to the user's environment 2.3 survey the user's environment for, eg • positioning of network cabling (or need for wireless systems), hubs, routers • location of stand-alone equipment • location of client servers • access to power supply • e environmental control 2.4 prepare and deliver a report on the survey 2.5 create an installation plan and schedule

Underpinning knowledge
1. Describe the reasons for surveying the user's environment prior to the installation of hardware equipment/systems, eg • safety • suitability • minimise disruption 2. Describe factors to be considered prior to installing hardware equipment and systems eg • access constraints o security o physical access o operational disruption

- b environmental
    - existing equipment
    - availability of utilities and services
    - ambient conditions

3. Identify potential problems which might affect installation, eg
    - health and safety issues
    - accommodation
    - availability of utilities and services
    - access to building
    - structure for cabling
4. Identify possible reasons for not proceeding with installation, eg health and safety issues, availability of utilities and services
5. Describe the main points that should be included in an installation plan covering
    - hardware equipment
    - system software
    - configuration.

Learning outcome
The learner will: 3. Install hardware equipment and systems
Assessment criteria
The learner can: 3.1 install and test hardware and systems, eg • stand-alone • peer-to-peer network • wireless network • client server • network cabling, switches and routers • network interface cards (NIC) • workstation • network printer 3.2 test the installed equipment, to confirm successful installation 3.3 identify, investigate and resolve any problems encountered 3.4 create and maintain installation records.

Underpinning knowledge
1. Describe test procedures for different types of hardware equipment and systems, eg • self-test • diagnostics • manual tests 2. Explain handling and transport procedures for hardware eg • packaging • antistatic precautions • movement

3. Describe types of network, eg
   - peer-to-peer
   - server based
   - wireless
4. Identify network topologies, eg
   - ring
   - star
   - bus
   - mesh
5. Describe the purpose of network interface cards eg
   - Ethernet
   - wireless
6. Identify suitable network media, eg
   - twisted pair
   - fibre optic
   - wireless
7. Describe the importance of keeping accurate installation records.

Learning outcome
The learner will: 4. Install and configure systems software
Assessment criteria
The learner can: 4.1 check the integrity of the software to be installed, eg virus check, and the installation media (disk scan) 4.2 install the software • operating system/networked operating system • device drivers • applications, eg browser, word processing, database 4.3 set up and configure a network, eg • user accounts • shared folders/access • user rights • group rights/permissions • passwords 4.4 configure maintenance routines, eg • system monitor • system tune up • back-up routines • virus monitoring • firewalls • passwords • encryption • access policies

4.5	identify and investigate any problems encountered, resolve and record the details
4.6	maintain installation records

Underpinning knowledge

1. Describe the types of actions required to preserve the integrity of the existing system and data, eg
   - backing up software and data
   - on-line back-up of system and data
   - logging out users
2. Explain why it is important to check the integrity of installation media eg
   - completeness
   - free from corruption
   - virus free
3. Identify potential conflicts between the planned installation and user requirements, eg
   - human
   - physical
   - technical
   - software levels
4. Describe what type of tests can be applied to confirm successful installation of system software, eg
   - built in diagnostics run
   - system loads successfully
5. Explain what types of information should be recorded on installation records, eg
   - name and version
   - licence number
   - contact/help numbers
6. Describe the importance of keeping accurate installation records
7. Describe security arrangements, eg
   - confidentiality
   - copyright
   - data protection
   - data loss and back-up
   - virus checking
   - firewalls
   - physical barriers

Learning outcome
The learner will: 5. Expand (by integration) ICT systems to allow additional facilities
Assessment criteria
The learner can: The candidate will be able to: 5.1 determine the expected functionality and performance of the expanded ICT system, eg additional • workstation • printer • scanner 5.2 identify a suitable method for integrating the ICT system, eg • connection to an existing connecting point • creating additional connection points 5.3 check the additional components for compatibility with the existing system 5.4 determine suitable configuration options for the intended additional components, eg • IP addresses • access authorisation • passwords • designations 5.5 determine what actions are required to preserve the integrity of any existing system or data, eg • back-up • anti-virus check • reconfiguration of firewall • reorganise user groups 5.6 prepare a plan for the integration of the ICT system which covers, eg • actions required to preserve the integrity of any existing system or data • configuration of components • installation of new components • tests to ensure that the expected functionality and performance have been achieved 5.7 install additional components and configure the systems 5.8 test the system to confirm that it functions 5.9 demonstrate the integrated system and train users as necessary 5.10 comply with relevant legislation and regulations for hardware when integrating systems

Unit 362 Install, configure and upgrade ICT software

UAN:	**L/501/3997**
Level:	3
Credit value:	7
GLH:	30
Aim:	This unit will enable the learner to install, configure and upgrade networked and stand-alone operating systems, and/or applications software.

Learning outcome
The learner will: 1. Prepare for the installation of software
Assessment criteria
The learner can: 1.1 assemble information and prepare plans for software installation including listing the items which need to be backed-up and the reasons for each 1.2 determine the specification and configuration of one or more systems using different methods 1.3 check that resources required for installation are available and that they are suitable including • confirming that the system meets the requirements of the new software • backing up system and scanning for viruses and spyware • recording the existing system specification 1.4 describe the type of action which should be included in a software installation plan 1.5 describe sources of installation media or files 1.6 explain the importance of protecting existing software and data 1.7 outline regulations relating to software licensing and installation 1.8 describe the items commonly found in a manufacturer's minimum system requirement 1.9 describe incompatibilities that can exist between software and systems (hardware and operating system)

Learning outcome
The learner will: 2. Install and configure a range of system and application software
Assessment criteria
The learner can: 2.1 install system and application software from a range of media to specified destinations using different installation options 2.2 install different types of system and application software 2.3 upgrade existing system and application software 2.4 maintain registration documentation and/or installation records 2.5 perform an automated deployment of a software application.

Learning outcome
The learner will: 3. Be able to check the system operates as planned during and after installation of system and application software
Assessment criteria
The learner can: 3.1 monitor the installation of software identifying any problems and errors and taking action to resolve them 3.2 check that the installed system and application software operates as expected on completion of installation 3.3 check the entire system operates as expected after system and application software installation 3.4 record problems/errors encountered, and actions taken.

Learning outcome
The learner will: 4. Resolve unwanted changes to the system caused by installation and configuration of system and application software
Assessment criteria
The learner can: 4.1 identify actions to correct unwanted changes to system operation and performance 4.2 make changes, as identified, to the software installation and configuration 4.3 check that the changes have improved system operation and performance 4.4 record any unwanted changes, recommendations, actions taken and results.

Unit 363 Network management and security

UAN:	**H/501/4010**
Level:	3
Credit value:	14
GLH:	95
Aim:	This unit will enable the candidate to configure, manage and troubleshoot the performance of Computer Networks.

Learning outcome
The learner will: 1. Know the principles of network design, performance and management
Assessment criteria
The learner can: 1.1 explain that network performance is reliant upon three basic principles. 1.2 explain how a hierarchical network design can be used to manage network traffic and help to optimise network performance. 1.3 describe the network characteristics of routers, switches and bridges and their potential effects upon network traffic management. 1.4 describe the effect of broadcast traffic on an ip network, broadcast domains and how to manage such traffic. 1.5 describe how the performance of a switched network typically differs from that of one using hubs. 1.6 describe how differing routing protocol characteristics can affect network performance. 1.7 describe how the selection of appropriate routing protocols can be a factor in understanding and managing network traffic on network links. 1.8 explain how different applications are more sensitive to delay and jitter in congested network. 1.9 explain how network congestion affects differing types of network traffic. 1.10 describe at least 2 possible unauthorised networked applications that may cause excess network traffic problems and relate this to acceptable use and security policies within an organisation.

Learning outcome
The learner will: 2. Know the principles of network security
Assessment criteria
The learner can: 2.1 describe how filters and queuing techniques quality of service (QOS) can be applied to network traffic to address congestion issues relating to differing protocol types. 2.2 describe the use of a software network protocol analyser (sniffer) tool to monitor networks and identify problems

Learning outcome
The learner will: 3. Perform network management functions
Assessment criteria
The learner can: 3.1 describe the difference between a network management system (NMS) and operational support system (OSS) 3.2 describe the elements of an NMS/OSS 3.3 explain the function of MIBS as a collection of access points with agents which report to the management station(s) 3.4 identify and describe the operation of network management protocols 3.5 identify examples of network management software (NMS) 3.6 explain that management software (NMS) and operational support systems (OSS) can be used to remotely configure and alter operating parameters of network devices in real time. 3.7 explain the terms mean time between failure (MTBF), mean time to repair (MTTR), up time, down time and useful life cycle 3.8 explain the terms redundancy, failover and single point of failure in a networking context and the relationship to MTBF (mean time between failure) and MTTR (mean time to repair).

Learning outcome
The learner will: 4. Perform network security functions
Assessment criteria
The learner can: 4.1 identify network equipment that can be remotely monitored and managed. 4.2 describe and justify at least 3 scenarios where it would be desirable to deploy redundant systems.

Unit 364 Plan for the delivery of ICT support services and assist in the acquisition of ICT systems

UAN:	**M/501/3992**
Level:	3
Credit value:	13
GLH:	90

Aim:

Learning outcome
The learner will: 1. Determine customer requirements for ICT systems and support services
Assessment criteria
The learner can: 1.1 identify and document the requirements of the customer for ICT system functionality and capacity, eg • current: o documents they process/use o information they store/keep o how they use stored information o transactions made with others o reports or documents they need to produce o designs they produce o what communications systems they use o who they communicate with • proposed: o number of users o data processing o transaction processing o design (eg graphics, web design, CAD) 1.2 identify and document the details of the customer's current system support provision 1.3 identify and document any customer constraints on the required ICT systems and services • implementation timescale • compatibility with existing systems • physical/environmental • availability

- regulatory
- financial
- reliability

1.4 carry out physical and electronic audits and monitoring to determine the extent and configuration of the customer's existing system, eg
- details of system components (printers, servers, workstations, etc)
- details of system configuration (layout, transmission media, topology, etc)
- details of the current operating system(s) and application software (location, version, revision, licensing and usage)
- details of current security arrangements (firewalls, virus protection, authorisations, password systems, etc)
- load distribution and levels over a period
- identify sources of information on ICT systems eg
- websites
- sales brochures
- product specifications

Underpinning knowledge

The learner will:

1. describe the reasons for determining customer requirements
2. describe commonly used methods of obtaining valid customer feedback
   - oral communication
     - face-to face
     - telephone
   - written communication
     - email
     - questionnaire
3. describe the features of different levels of support, eg
   - on site repair
   - hours per day/days per week/response times
   - return to workshop
   - warranty
   - contracted time and materials
   - escalation
   - technical courier
   - expertise of technician
4. describe commonly available ICT systems and services
   - hardware
   - software
   - development, eg designing, creating, implementing and integrating ICT components
   - support, eg training, maintenance, advice and assistance
5. describe the type of constraints which customers may impose

- implementation timescale
- compatibility with existing systems
- physical/environmental
- availability
- regulatory
- financial
- reliability

6. describe available sources of information on ICT systems and providers of ICT services and how to assess their reliability. Sources should include:
   - direct eg from the
     - manufacturer
     - service provider
   - independent eg
     - press reviews
     - existing users
7. 7 describe how ICT systems are specified in terms of function and capacity
   - function:
     - inputs
     - processes
     - outputs
   - capacity:
     - access, eg number of simultaneous users, speed of response
     - processing
     - storage
8. describe how ICT services are specified
   - services to be provided
   - periods of availability
   - procedures to be followed when requesting and delivering services
9. explain that changes to systems need to be supported by clearly defined benefits and a business case.

Learning outcome
The learner will: 2. Evaluate available ICT systems and services against customer requirements
Assessment criteria
The learner can: 2.1 evaluate the obtained system and support information by • comparing it with customer requirements • identifying shortfalls • documenting the results • creating or amending plans 2.2 select suitable equipment to meet customer needs, eg

- stand-alone PC
- networked PC
- server
- operating system (eg MS Windows/Unix/proprietary)
- applications software

2.3 create documentation to define a customer's service requirements in detail, eg reports, procedures, presentation

Underpinning knowledge

1. describe the factors to be taken into account when assessing obtained information against customer needs and constraints
   - implementation timescale
   - compatibility with existing systems
   - physical/environmental
   - regulatory
   - financial
   - reliability
2. describe areas of ICT system use that may be inefficient, covering:
   - hardware
     - location
     - quantity
     - type
     - configuration)
   - software
     - ease of use
     - functionality
     - configuration
   - use of materials
     - type
     - wastage
   - services
     - coverage
     - level
     - availability
3. describe suitable formats for recording evaluation results
   - spreadsheets
   - database
   - documents
4. describe defects which can arise in information when it is collected
   - inaccuracies
   - duplications
   - omissions
   - inconsistencies
   - redundancies.

Learning outcome
The learner will: 3. Prepare and present suitable options for the acquisition of ICT systems and support services
Assessment criteria
The learner can: 3.1 present a range of possible system solutions in a clear and timely way, making recommendations, and taking into account, eg • cost • timescales • limitations • benefits • maintainability • availability • reliability 3.2 prepare and present two alternative specifications for a service level agreement (SLA), to include, eg • on-site / return to workshop / time and parts / remote • response timescales (same day / next day / office hours / 24 hours / Monday-Friday / 7 days • warranty arrangements • consultancy • preventative maintenance • life cycle management • training • helpdesk • on-line assistance 3.3 gather customers requirements taking their SLA into account 3.4 negotiate effectively and empathetically with customers 3.5 be fully accountable for the quality and effectiveness of designs and plans

Underpinning knowledge
1. describe methods of improving the efficiency of ICT system use covering: • hardware/software, eg re-configuration, upgrades, replacement • use of materials, eg other sources, storage, stock control • services, eg improved response rates 2. describe the factors contributing to technical assessments or evaluations of potential improvements • cost • impact on customer organisation • effectiveness 3. describe the essential points of a service level agreement (SLA), eg • details of parties to the agreement

- level of service to be delivered
- any penalties for failure to conform
- any bonuses for delivery above target
- start and finish times
- measurement criteria
- equipment covered

4. explain the importance of negotiation and of accurately communicating relevant information to all customers
   - design and plan activities
   - SLAs
   - support activities and agreements
5. identify required customer ICT skills
6. identify that designs and plans should
   - only include services and equipment approved for use
   - be monitored
   - use structured processes and procedures
7. explain the importance of being accountable for designs and plans
8. explain the importance of reviewing SLAs to support
   - systems changes
   - business requirements.

Learning outcome
The learner will: 4. Develop plans to ensure that the ICT infrastructure delivers the required functionality, capacity and level of support
Assessment criteria
The learner can: 4.1 create a plan to implement previously agreed changes to system and support services including, eg • upgrade/replacement of existing system hardware/software • enhancements to support provision • changes to system functionality, capacity and maintenance • user training requirement as a result of the changes • methods of monitoring the effectiveness of the support provision 4.2 devise change control documentation for use during change implementation 4.3 develop an outline contingency plan to enable recovery from • hardware failure (PC, server, mainframe) • environmental disaster (flood, fire, earthquake etc) • power failure • major loss of data • serious security breaches to enable o i business continuity in another location o ii recovery of existing system function o iii restoration of data

Underpinning knowledge

1. describe methods to measure the effectiveness of customer support functions
2. explain reasons why the effectiveness of service delivery should be monitored and recorded
3. explain reasons why change control must be maintained, eg
   - conformance to BS/ISO standards
   - to define the current state of IT systems and services
   - to ensure work is carried out in a controlled manner
   - to prevent misunderstandings and unauthorised modifications to an ICT system or service
4. explain why customer's staff may require coaching, eg
   - new product(s)
   - new service(s)
   - new procedure(s)
   - new staff
   - skill uplift needed
5. describe the business/commercial reasons for contingency planning
6. describe the relative value of data compared to systems
7. describe different back-up methods for a range of data types, eg
   - invoices
   - payroll
   - HR records
8. describe different levels of contingency planning, eg
   - hardware
   - range
   - PC
   - server
   - mainframe
   - power
   - business continuity.

Unit 365 Principles of planning telecommunications services

UAN:	**L/501/4003**
Level:	3
Credit value:	10
GLH:	65
Aim:	This unit will provide the learner with the basic principles needed to plan a telecommunications service. Learners will be able to develop an understanding of how telecommunications services are specified, planned and provided.

Learning outcome
The learner will: 1. Prepare for and carry out a site survey for the provision of telecoms services
Assessment criteria
The learner can: 1.1 identify the areas and systems and equipment required to be surveyed from the planning request including equipment accommodation areas, existing and planned systems and equipment, cable routings, power and environmental services, building structure 1.2 identify the full range of data required from the survey 1.3 obtain plans and records of the areas to be surveyed and interpret them 1.4 collect and record the data required from the survey 1.5 record details that may affect the planning options.

Learning outcome
The learner will: 2. Identify a range of options for the provision of telecoms services and select the optimum solution
Assessment criteria
The learner can: 2.1 gather sufficient information to be able to identify future demands for existing telecoms services and proposed new telecoms services 2.2 plan the collection of the information in a timescale suitable for achieving the forecast future demand 2.3 evaluate the information objectively, and use it to identify a range of options that • are sufficiently detailed to enable an objective comparison to be made • comply with relevant legislation, regulations and organisational obligations • consider the availability of existing systems, support services and accommodation • take account of longer term requirements 2.4 calculate the broad costs of the options including cost of equipment and materials, installation costs, running and maintenance costs 2.5 select and document the optimum solution in sufficient detail to meet the requirements of the customer 2.6 obtain authority to proceed 2.7 process the selected option to meet agreed timescale for the delivery of the requirements.

Learning outcome
The learner will: 3. Produce designs for the provision of telecoms services
Assessment criteria
The learner can: 3.1 produce designs for telecoms systems 3.2 produce designs that • are based on information that is sufficient, valid, current and reliable • take account of present and future requirements • contain sufficient detail for components to be identified and quantified • optimise resources • are practicable, and will deliver the specified telecoms services 3.3 use design tools that are suitable for the purpose 3.4 identify components for the telecoms systems that • are approved • take account of relevant environmental constraints • optimise costs • take account of availability and required timescales 3.5 specify the quantities of component taking into account • existing and already planned plant and services • present and predictable future requirements • design requirements 3.6 specify locations that • optimise resources, and take account of present and predictable future requirements • comply with health and safety and other relevant legislation, and regulations • minimise interference, degradation or disruption to other services and activities • satisfy operational and environmental requirements and constraints • take account of other relevant existing and planned plant and services 3.7 identify, evaluate and record actual and potential hazards or hazardous substances which may be encountered at the proposed locations 3.8 document the selected option in sufficient details and obtain relevant authority to proceed.

Learning outcome
The learner will: 4. Produce detailed plans for telecoms services
Assessment criteria
The learner can: 4.1 produce plans that specify works activities that • comply with relevant legislation, regulations, and safe working practices • optimise the use of resources • deliver the telecoms services • maintain existing services while work is carried out • control risks that have been identified • identify procedures and instructions to be followed 4.2 produce plans that • accurately identify equipment locations • identify the systems, equipment and materials to be provided • identify the risks that may be encountered during work activities • provide sufficient information to be able to carry out the work • identify the manpower required to carry out the work • ensure the resources are available to meet the required timescales 4.3 prepare costings that • are based on accurate current information • are within budget • allow for contingencies • are recorded clearly and accurately in an approved format 4.4 calculate the costs of resources including • systems, equipment and materials • accommodation and support services • manpower • sub-contract work • the hire of specialist equipment.

Learning outcome
The learner will: 5. Co-ordinate the provision of telecoms services
Assessment criteria
The learner can: 5.1 identify the work activities to be scheduled and agree the resources available to undertake the work 5.2 obtain details of the work activities to enable the development of a realistic works programme 5.3 schedule the works packages taking into account: • their required timescale • the availability of resources • the inter-dependency of work activities 5.4 review the works programme at regular intervals to ensure all target dates are being met and revise where necessary 5.5 allocate work so that it will: • enable the effective and efficient use of resources • take account of team and individual competencies 5.6 maintain a level of resources at the work sites consistent with meeting the required timescales 5.7 collect information on work progress at regular intervals for analysis to confirm the targets are being met 5.8 report details of work completed promptly and accurately to the appropriate people.

Unit 366 Requirements analysis and systems specifications

UAN:	**D/501/4006**
Level:	3
Credit value:	16
GLH:	65
Aim:	The aim of this unit is to provide learners with an advanced understanding of some of the important elements involved in systems design, especially the idea of following a Systems Development Life Cycle (SDLC). It also allows them to follow a prescribed methodology such as Yourdon or SSADM; it also allows them to competently and professionally work with a scenario to identify the best possible IT solution to meet their needs. Learners will develop a more in depth understanding of advanced systems investigation, Analysis and design; this will also enable them to work in a supervisory role performing advanced tasks with high degree of competence, using problem solving skills and giving direction to others.

Learning outcome
The learner will: 1. Plan for the identification of customer requirements
Assessment criteria
The learner can: 1.1 interpret project briefs to identify the scope and objectives of investigations and analyses 1.2 select investigative methods to extract the information to identify customer requirements 1.3 produce a plan for carrying out investigations and analyses using most appropriate tools.

Learning outcome
The learner will: 2. Establish customer requirements
Assessment criteria
The learner can: 2.1 carry out investigations to meet agreed plans 2.2 use investigative methods to obtain information on system inputs, outputs, processes, user interfaces and frequency 2.3 interpret and draw document analysis grids 2.4 identify constraints 2.5 obtain approval/sign off

Learning outcome
The learner will: 3. Produce logical and physical design specifications
Assessment criteria
The learner can: 3.1 carry out analyses to meet agreed plans 3.2 identify logical functional and data requirements 3.3 create a data dictionary 3.4 select and produce suitable diagrammatical representations for modelling 3.5 create and extract information from decision tables/trees 3.6 specify capacity requirements 3.7 check for defects in the requirements definition 3.8 produce hardware and software specifications 3.9 produce specifications for input and output data and security requirements 3.10 obtain approval/sign off.

Learning outcome
The learner will: 4. Identify implementation and maintenance procedures
Assessment criteria
The learner can: 4.1 describe the main stages of system implementation: 4.2 describe the purpose and methods of testing new systems 4.3 describe training methods and techniques 4.4 describe methods used to convert manual files and the main problems associated with file conversion 4.5 describe the typical documentation provided on completion of implementation: 4.6 explain the purpose of version control procedures when developing, amending and maintaining software and documentation 4.7 state that maintenance is the process of responding to a user request for change plus correction of errors.

Unit 367 ICT repair centre procedure

UAN:	**A/501/4000**
Level:	3
Credit value:	8
GLH:	30
Aim:	This unit will enable the learner to assess and specify technical resource requirements of a range of typical repair centres. N.B. It is not necessary for the assessment of this unit to be undertaken in a workshop. However, the centre is advised to make available a specific location (room/building) on which the learner can base the planning process.

Learning outcome
The learner will: 1. Describe legislative requirements for repair centre operations
Assessment criteria
The learner can: 1.1 evaluate the current requirements of health and safety and environmental legislation as applicable to repair centre operations 1.2 describe the regulatory requirements for data protection, confidentiality and software licensing.

Learning outcome
The learner will: 2. Detail specific technical resource requirements for repair centre operations
Assessment criteria
The learner can: 2.1 describe the specific technical and safety requirements 2.2 locate and extract information on specific technical and safety requirements for repair centre operations 2.3 identify resource requirements for a repair centre 2.4 evaluate information gained and decide on its applicability to specific repair centre operations.

Learning outcome
The learner will: 3. Develop a repair centre specification
Assessment criteria
The learner can: 3.1 identify issues affecting the provision of technical resources 3.2 identify sources to obtain information for equipment to be repaired including manufacturers' test and repair specifications for equipment, health and safety and environmental legislation 3.3 produce a report outlining the risk factors, options to minimise them and recommendations as to the most appropriate options 3.4 produce repair centre work instructions for using test equipment 3.5 describe the main steps to the development of specifications for repair centre operations 3.6 outline methods for carrying out workplace risk assessments for planned new operations and recording findings.

Learning outcome
The learner will: 4. Provide technical support to others
Assessment criteria
The learner can: 4.1 produce local repair work instructions considering the major factors 4.2 produce local work instructions for post repair testing.

Unit 368 ICT systems and network management

UAN:	**Y/501/3999**
Level:	3
Credit value:	18
GLH:	115
Aim:	This unit will enable the learner to monitor and control the operation of IT systems (stand-alone, peer-to-peer, client server wireless LAN). Learners will also gain knowledge of wide area, metropolitan and global networks.

Learning outcome
The learner will: 1. Be able to monitor and control the operation and performance of IT systems
Assessment criteria
The learner can: 1.1 use industry standard tools to monitor the operation and performance of IT systems 1.2 interpret the information provided by system monitoring tools 1.3 identify failures of IT systems to meet operational requirements and initiate required actions to remedy them 1.4 create and maintain operational records 1.5 know the relevant safety regulations for IT system operation.

Learning outcome
The learner will: 2. be able to recommend improvements in the use of IT systems
Assessment criteria
The learner can: 2.1 review customers' use of IT systems and assess the feasibility of potential improvements 2.2 make recommendations, including justifications, on improving the use of IT systems 2.3 explain the importance of presenting recommendations in a manner suited to the needs of the audience.

Learning outcome
The learner will: 3. Control the routine maintenance of IT systems and resources
Assessment criteria
The learner can: 3.1 create routine maintenance schedules that meet regulations and minimise disruption to system users 3.2 control the physical storage and issue of system media and documentation, including records of system maintenance 3.3 know what factors must be taken into account when scheduling maintenance 3.4 identify and quantify the consumable materials required to meet operational requirements 3.5 describe the environmental conditions that need to be taken into account when storing system media, documentation and consumable materials.

Learning outcome
The learner will: 4. Administer IT system resources and user profiles
Assessment criteria
The learner can: 4.1 design an efficient file storage structure 4.2 monitor and maintain file storage structures 4.3 monitor and configure networks and data communications 4.4 specify and control system backups 4.5 administer user profiles.

Unit 369 Develop ICT technical documentation and procedures

UAN:	**F/501/4001**
Level:	3
Credit value:	5
GLH:	25
Aim:	This unit will enable the learner to develop technical documentation and procedures. The documentation will be confined to basic operational instructions/procedures and information recording pro forma.

Learning outcome
The learner will: 1. Identify requirements for technical documentation and procedures
Assessment criteria
The learner can: 1.1 identify sources of difficulty experienced by the customer 1.2 establish the type of documentation and procedures required 1.3 identify valid sources of information on which to base the documentation and procedures 1.4 extract relevant sufficient information and prepare a plan for the production and quality assurance of the required documentation and procedures 1.5 describe the typical content of a plan for the production of documentation and procedures to ensure quality assurance 1.6 outline the regulations applying to the use of information.

Learning outcome
The learner will: 2. Produce draft technical documentation and procedures
Assessment criteria
The learner can: 2.1 design a suitable format in which to present the information and select a suitable method for producing the documentation 2.2 plan the content to include: • index • contents list • pictures of screens • pictures of keyboard/equipment • flow charts • written instructions/information • references 2.3 produce draft documentation and procedures 2.4 identify list of content requirements 2.5 explain the importance of independent checking of documentation for production errors 2.6 explain the reasons for having standard document formats within an organisation

Learning outcome
The learner will: 3. Ensure the quality of documentation and procedures produced
Assessment criteria
The learner can: 3.1 review the documentation for technical accuracy 3.2 pilot the documentation with customers to obtain feedback and modify accordingly 3.3 explain the reasons for reviewing the technical accuracy of documentation and procedures with peers 3.4 explain the reason and purposes for piloting documentation with customers, eg clarity, ease of understanding, suitability of delivery method 3.5 describe commonly used methods of obtaining feedback.

Unit 370 Voice and data communications

UAN:	**M/501/4009**
Level:	3
Credit value:	11
GLH:	50
Aim:	The aim of this unit is to enable the learner to describe the principles and concepts involved in voice communication, describe the principles and concepts involved in data communication, explain the operational characteristics of Personal, Local, Metropolitan and Wide Area Networks (PAN, LAN, MAN and WAN), describe the operational and control characteristics of networks at the data link layer, explain the operational characteristics of the Transmission Control and Internet Protocols (TCP/IP) and describe the features of Voice over Internet Protocol (VoIP).

Learning outcome
The learner will: 1. Know the principles and concepts involved in voice communications
Assessment criteria
The learner can: 1.1 Describe the **components** of a simple voice communication system 1.2 Describe the different **media** used for voice communication 1.3 Identify and describe the circuit elements of a telephone instrument sufficient to show the principles of transmitting and receiving 1.4 Explain the meaning of 'sidetone' 1.5 List the disadvantages of excessive sidetone and of no sidetone 1.6 Explain the need for switching in telecommunication networks 1.7 Describe, with the aid of diagrams, how **signals** are detected by the telephone instrument or exchange equipment in electronic exchange systems 1.8 Explain numbering schemes for local, national, and international calls 1.9 Describe value added exchange **services** 1.10 Explain the meaning of the term telephone traffic and its effect on switching 1.11 Define the Erlang as the unit of traffic intensity 1.12 Describe, with the aid of sketches, typical graphs of telephone

traffic intensity against time over a 24-hour period for both national and international exchanges

1.13 Describe the terms 'traffic offered', 'traffic carried', 'traffic lost' and 'busy hour'

1.14 Define grades of service as a ratio of traffic lost to traffic offered, or the probability of blocking

1.15 Describe the physical **components** of the Access Network

1.16 Describe the physical **components** of Core Networks

1.17 Evaluate typical call events between customers in the same exchange (local call) and in different exchanges (trunk call)

1.18 Differentiate between the basic **technologies** used in the access networks to provide digital transmission capability.

Range

components: source, transmitter, transmission system, receiver, destination

media: copper cable, fibre optical cable, radio waves

signals: calling signal, dial pulses, keypad pulses, multi-frequency keypad signals, ringing, called customer answer, cleardown

services: call diversion, call-back, hold call, 3-party conversation

components: eg copper twisted wire cables, poles; connection points eg SCP (Secondary Connection Point), joint boxes, cable ducting, concentrators, Main Distribution Frame (MDF), leased lines

components: eg switches, multiplexers, regenerators, optical fibres, microwave radio links, ring technology, leased lines

technologies: Integrated Services Digital Network (ISDN, ISDN2, ISDN2e), Asymmetric Digital Subscribers Line (ADSL), modem

Learning outcome

The learner will:

2. Know the principles and concepts involved in data communications

Assessment criteria

The learner can:

2.1 Describe the **components** of a simple data communication system

2.2 Describe the different **media** used for data communication

2.3 Differentiate between typical bit error rates (BER) for common media

2.4 Describe serial and parallel data formats and their inter-conversion

2.5 Compare synchronous and synchronous character frames

2.6 Compare circuit switching, message switching and packet switching

2.7 Describe a typical packet frame as used in a wide area network (WAN)

2.8 Explain what is meant by a virtual circuit.

2.9 Describe what is meant by a 'datagram'

2.10 Describe the forms of access to a packet switched exchange

2.11 Explain what is meant by a permanent virtual circuit

2.12 Describe a packet-switching network

2.13 Describe a typical routing algorithm for a packet-switching network

2.14 Describe what is meant by: source coding, channel coding, line

coding

2.15 Describe the packet switching protocol X.25

2.16 Describe the WAN data services

2.17 Explain what is meant by fast packet switching

2.18 Compare and contrast the two basic methods of error correction: 'automatic repeat request' (ARQ) and forward error correction (FEC).

Range
components: source, transmitter, transmission system, receiver, destination **media**: copper cable, fibre optical cable, radio waves

Learning outcome
The learner will: 3. Know the operational characteristics of Personal, Local, Metropolitan and Wide Area Networks (PAN, LAN, MAN and WAN)
Assessment criteria
The learner can: 3.1 Describe the functions and topologies of local area networks (LAN) 3.2 Explain the difference between broadcast-media-access and non-broadcast-media access technologies 3.3 Identify the various shared media LAN **technologies** in use today and their operating speeds 3.4 Describe how Ethernet and Token Ring Technologies work 3.5 Explain the terms half and full duplex 3.6 Describe LAN **topologies** 3.7 Describe the role of LAN components 3.8 Identify the **layers** in the Open Systems Interconnect (OSI) 7-layer model and explain the data link and network layers 3.9 Explain the cause and effect of congestion on a network 3.10 Identify **factors**, which will reduce the total throughput of data within a LAN or reduce the bandwidth available for each individual node 3.11 Identify the different transmission **media** deployed in LANs 3.12 Identify and explain examples of Personal Area Network wireless access technology 3.13 Describe the advantages of wireless access networks 3.14 Identify the relevant standards for wireless access for LANs (IEEE).

Range
technologies: Ethernet, Token Ring, Fibre Distributed Data Interface (FDDI), Fast Ethernet, Gigabit Ethernet **topologies**: bus, tree, ring and star, extended star **layers**: data link, network **factors**: Ethernet collisions, high volume of users, broadcast storms, inadequate physical segmentation, increased traffic, data backup procedures, faulty cabling, electro Magnetic Interference (EMI) **media**: Shielded Twisted Pair (STP), Unshielded Twisted Pair (UTP), coaxial cable, optical fibre, wireless

Learning outcome
The learner will: 4. Know the operational and control characteristics of networks at the data link layer
Assessment criteria
The learner can: 4.1 explain the role of the data link layer in the OSI and give **examples of data link layer protocols** 4.2 understand how flow control is implemented at the data link layer as well as list and explain the different **flow control methods** 4.3 explain error detection and control in data transmission and give **examples of error-detection schemes** 4.4 describe in detail the HDLC protocol explaining basic characteristics, frame structure and operation 4.5 describe the basic construction, operation and facilities offered by frame relay construction: format and size 4.6 explain the main **factors** which make frame relay protocol capable of higher bit rates than standard HDLC protocol 4.7 describe the basic **construction**, **operation** and **facilities** provided by X.25 packet switching protocol 4.8 describe the basic construction, operation and **facilities offered by the ATM protocol construction**: format, size, Virtual Path Identifier (VPI), Virtual Channel Identifier (VCI) 4.9 describe the IEEE 802.3 frame format and explain the function of each **field**

Range
Examples of data link layer protocols: HDLC, Logical Link Control (LLC) **Flow control methods**: stop-and-wait, sliding-window **Examples of error-detection schemes**: parity check, Cyclic Redundancy Check (CRC) **Factors**: reduced error checking, existence of error checking, recovery in higher-level protocols **Construction**: format, size **Operation**: Link Access Procedure Balanced (LAPB), incoming and both-way, set-up and cleardown, Switched Virtual Circuit (SVC) and Permanent Virtual Circuit (PVC) **Facilities**: routing by Network User Address (NUA), error checking, cyclic count, Packet Assembler/Disassembler (PAD), fault logging **Facilities offered by the ATM protocol construction**: Quality of Service (QoS) **Fields**: preamble, Start Frame Delimiter (SFD), Destination Address (DA), Source Address (SA), length type, Logical Link Control (LLC) data, pad, Frame Check Sequence (FCS)

Learning outcome
The learner will: 5. Know the operational characteristics of the Transmission Control and Internet Protocols (TCP/IP)
Assessment criteria
The learner can: 5.1 produce a concise outline of the main features of the TCP/IP protocol, referencing the Department of Defence (DOD) protocol model and comparing with the International Standards Organisation (ISO)/Open Systems Interconnect (OSI) model 5.2 outline in detail, the **function** and **operation** of the TCP protocol 5.3 sketch the IP version 4 datagram format and briefly explain the function of the different fields 5.4 give reasons for the need to continue the development of the Internet Protocol (eg IP version 6) 5.5 outline the function and operation of the IP protocol 5.6 list the individual **layers** of the TCP/IP model and explain their functions 5.7 list the 'well known' TCP **port** numbers and state the function of each port 5.8 identify and explain the purpose and function of a protocol for each layer of the TCP/IP protocol suite 5.9 list the 'well known' User Datagram Protocol (UDP) port numbers and state the function of each port 5.10 explain base 2, base 10 and base 16 numbering systems and convert from one to the other using binary, hexadecimal and dotted decimal notation of IP addresses 5.11 explain the classful Internet addressing scheme, identifying the classes and their default subnet masks, network and host ranges 5.12 describe the format of the MAC addressing scheme 5.13 explain the importance of the Advanced Resolution Protocol (ARP)

and the reverse Resolution Protocol (RARP)

5.14 explain why there is a need for subnetting and how subnetting is implemented

5.15 identify the requirement for Variable Length Subnet Masking (VLSM)

5.16 identify broadcast addresses within a subnetted network-addressing scheme

5.17 identify the network and host portions of a given complete IP address and subnet mask

5.18 calculate subnet addresses and list the host ranges for each subnet within a given subnetted. IP addressing scheme

5.19 state the loop-back, unassigned and private IP addresses

5.20 give reasons for the allocation of **reserved** IP addresses

5.21 identify the UK body responsible for allocating IP addresses

5.22 give reasons for implementing private IP addressing (eg to preserve IP addresses and for security purposes)

5.23 explain the purpose and use of Dynamic Host Configuration Protocol (DHCP) and DNS

5.24 differentiate between the uses of routers, bridges and switches within interconnected IP networks

Range
function: data recovery, flow control, guaranteed delivery
operation: three-way handshake, port allocation, data segmentation
layers: application layer, transport layer, Internet layer, network access layer
ports: 21-file transfer protocol (ftp), 23-telnet, 25-simple mail transfer protocol (SMTP), 80-hyper text transfer protocol (http)
ports: 53-Domain Name Service (DNS), 69-Trivial File Transfer Protocol (TFTP)
reserved addresses: loopback, unassigned, private

Learning outcome
The learner will:
6. Know the features of Voice over Internet Protocol (VoIP)
Assessment criteria
The learner can:
6.1 explain the increased popularity in IP telephony as opposed to legacy switched networks
6.2 list the drivers for convergence
6.3 state the advantages of a converged network
6.4 describe the main components and protocols used in PBXs
6.5 contrast these with their IP equivalent
6.6 compare the alternative signalling standards
6.7 explain why specific standards are required for signalling and transmission
6.8 state the Quality of Service issues and how to overcome them
6.9 list the application advantages available with an all IP network
6.10 describe the implementation issues
6.11 describe the benefits of the new convergence market

Unit 384 Business concepts

UAN:	**K/502/1119**
Level:	3
Credit value:	6
GLH:	60
Aim:	The aim of this unit is to enable learners to understand the principles of business operations, structure, functions and legislative constraints. Learners will develop the skills required to understand business needs to enable them to provide business solutions to fulfil these needs.

Learning outcome
The learner will: 1. Be able to explain business structures and key business functions
Assessment criteria
The learner can: 1.1 identify types of business organisations 1.2 identify the structure and management of organisations 1.3 interpret or produce an organisation chart to show the structure of a business 1.4 identify and explain key business functions and the flow of information between them 1.5 specify the roles and responsibilities within an organisation.

Learning outcome
The learner will: 2. Be able to explain legislative issues for business
Assessment criteria
The learner can: 2.1 specify legislation affecting organisations 2.2 specify security measures needed to comply with legislation and maintain integrity of data.

Learning outcome
The learner will: 3. Be able to analyse financial information
Assessment criteria
The learner can: 3.1 select and analyse financial information to support the business decisions 3.2 analyse management accounting information.

Learning outcome
The learner will: 4. Be able to evaluate strategic information
Assessment criteria
The learner can: 4.1 investigate sources of finance 4.2 interpret and analyse a business plan 4.3 acquire internal information to monitor organisational key performance indicators 4.4 use performance measurement techniques 4.5 use methods for investment appraisal.

Unit 387 Unix operating system

UAN:	**H/502/1118**
Level:	3
Credit value:	9
GLH:	60
Aim:	The aim of this unit is to enable learners to attain the required skills for using and working in a UNIX operating system environment. The unit content concentrates on the common approach to the variants of UNIX whilst looking at some specific areas of various systems and shells.

Learning outcome
The learner will: 1. Introduction to the UNIX operating system environment
Assessment criteria
The learner can: 1.1 Provide login name and password to log in and identify the type of user and session entered 1.2 Identify the shell from its command line prompt 1.3 Execute a command with options and arguments 1.4 Run and interpret the results of UNIX commands 1.5 Find help about UNIX commands and configuration files 1.6 Logout from the system 1.7 Interpret the content of directories under the root of the file system 1.8 Set up arguments to a command file and directory names 1.9 Navigate the directory structure with the cd command 1.10 Identify and interpret (using ls –l) file and directory attributes 1.11 Execute file and directory manipulation commands 1.12 Execute commands, to identify, read and manipulate text files 1.13 Use the keys allowing the change between modes in vi 1.14 Execute commands used in each of the command and insert vi modes 1.15 Execute commands used in the 'ex' vi modes commands.

Learning outcome
The learner will: 2. Configure and apply Shell environment and write shell scripts
Assessment criteria
The learner can: 2.1 Write command lines implementing shell meta-characters 2.2 Generate filename wildcard (globbing) instructions for the shell 2.3 Select on the command line the correct quotation characters for the task in hand 2.4 Write shell aliases to 'rename' commands 2.5 Recall previously entered commands 2.6 Configure vi as the editor for editing previously entered commands 2.7 Execute set command to identify shell variables 2.8 Demonstrate the parent/child process relationship of processes 2.9 Obtain the list of all available elements of shell environment 2.10 Create a re-assign for a variable value 2.11 Identify the meaning of any shell predefined variable 2.12 Identify the values for any predefined shell variable 2.13 Pass variable definitions to sub-shells 2.14 Use directory shortcut ('tilde') character on the command line 2.15 Identify a shell script by inspecting its content 2.16 Execute a shell script 2.17 Apply correctly the hash character inside shell scripts 2.18 Interpret the shell positional parameters by inspecting the command line 2.19 Establish the exit status (success or failure) of the last command, by executing echo $? Command 2.20 Implement the if-then-else-fi statement to make a decision based on the exit status of the last command 2.21 Construct a multiple choice if statement, using if-then-elif-then- … fi 2.22 Write a script that takes the value for a variable from the command line – using positional parameter list and inside the script – using the read command 2.23 Write the for-do-done loop stepping through a list of values 2.24 Implement different methods of generating a list of values for the for loop to step through 2.25 Use other programming facilities offered within shell scripts 2.26 test a shell script and resolve any errors.

Learning outcome
The learner will: 3. Control data flow using redirection and pipes
Assessment criteria
The learner can: 3.1 Use correct redirection symbols on the command line 3.2 Construct command lines capable of redirecting data into log files and into /dev/null 3.3 Use correct syntax that performs proper stream merging 3.4 Use input stream redirection, to use shell to open a file 3.5 Apply double redirect symbol to preserve file content on redirection 3.6 Configure the shell to stop the shell from clearing the content on redirection, yet still allow it to empty the file, on request only 3.7 Apply syntax that will override the noclobber option 3.8 Apply correctly constructed pipelines, to ensure that system resources are not wasted through a long sequence of slow commands 3.9 Execute filter tool commands with correct syntax.

Learning outcome
The learner will: 4. Interrogate and manipulate UNIX processes
Assessment criteria
The learner can: 4.1 Execute process interrogation tools 4.2 Terminate a process 4.3 Execute type and whence commands to classify command types 4.4 Manipulate background tasks 4.5 Use parentheses to group commands and force them to be run in a common sub-shell 4.6 Configure a deferred task.

Learning outcome
The learner will: 5. Control file and directory access and use find
Assessment criteria
The learner can: 5.1 Interrogate the content of a directory and i-node table 5.2 Create links 5.3 Identify file and directory attributes that control access to them 5.4 Set file and directory permissions, to correctly reflect their meaning 5.5 Execute the chmod command to modify file or directory permissions 5.6 Formulate the find command with correct syntax 5.7 Construct find command lines capable of locating files according to search criteria 5.8 Apply one or more of the find actions, for example.

Learning outcome
The learner will: 6. Operate within Transport Control Protocol/Internet Protocol (TCP/IP) network environment
Assessment criteria
The learner can: 6.1 Derive network interface related information 6.2 Apply simple communication diagnostics tools 6.3 Use the tools coming from the SSSH (Secure Socket Shell) set of commands 6.4 Configure your host as a server for remote X Windows applications 6.5 Set the DISPLAY variable to affect remote display.

Learning outcome
The learner will: 7. Use advanced tools
Assessment criteria
The learner can: 7.1 Match basic regular expression (RE) characters to represent patterns 7.2 Use UNIX tools and utilities that incorporate regular expressions 7.3 Construct a sed command line to achieve text file editing tasks 7.4 Apply regular expressions in grep command line, to effect sophisticated pattern search task 7.5 Construct a tar command to: perform a file/directory backup, inspection and restore 7.6 Use a combination of available compress/decompress tools.

Unit 388 Creative problem solving

UAN:	**D/502/1117**
Level:	3
Credit value:	5
GLH:	30
Aim:	The aim of this unit is to enable learners to understand the process of analysing a problem and providing a solution. Learners will develop the skills to write a problem statement, generate, select and evaluate possible solutions and plan for successful implementation.

Learning outcome
The learner will: 1. Be able to identify and analyse a problem
Assessment criteria
The learner can: 1.1 select and use a technique to obtain information on a problem 1.2 provide solution criteria 1.3 create a problem statement 1.4 create an impact statement using time, cost, personnel issues 1.5 select and use analysis techniques to look at causes and potential solutions to problems 1.6 compare the main features and risks of each possible solution 1.7 Use tools like BOSCARD to make clear what is required.

Learning outcome
The learner will: 2. Be able to plan, monitor and evaluate an implementation/a problem solution
Assessment criteria
The learner can: 2.1 identify the steps to solve the problem using their preferred solution 2.2 use diagrammatic representations or charts to plan the solution implementation 2.3 present the solution to a line manager or experienced person 2.4 collect data around the problem 2.5 analyse data collected using established methodologies 2.6 monitor and evaluate progress as the implementation progresses 2.7 plan tasks in a chronological and logical order 2.8 justify the solution to the decision maker 2.9 log results in a systematic and consistent manner.

Learning outcome
The learner will: 3. Review their approach to problem solving and the proposed problem solution
Assessment criteria
The learner can: 3.1 check if the problem has been solved by gathering and comparing data to benchmarked data 3.2 assess whether the solution met the original criteria for the problem to be deemed solved 3.3 create a logical and easily understood document / presentation showing the results and the degree of success in solving the problem 3.4 create a summary of lessons learned to apply to the next problem 3.5 create a summary of lessons learned for the solution, concerning the approach used in the problem-solving process 3.6 run a review session.

Unit 389 Develop software using SQL

UAN:	**H/501/4007**
Level:	3
Credit value:	9
GLH:	40
Aim:	The aim of this unit is to enable learners to develop the skills required to create queries, provide reports, manipulate data and document test results in a Relational Database Management System (RDMS).

Learning outcome
The learner will: 1. Know how to query and display data from a single table
Assessment criteria
The learner can: 1.1 create a query 1.2 limit the rows retrieved by a query 1.3 sort the rows retrieved by a query in ascending or descending order and by single and/or multiple columns by use of the ORDER BY clause.

Learning outcome
The learner will: 2. Query and display data from multiple tables
Assessment criteria
The learner can: 2.1 interpret an Entity Relationship Diagram (ERD) 2.2 resolve ambiguous column names in a query by use of qualifiers 2.3 retrieve data from multiple tables 2.4 create a query using joins to retrieve records 2.5 create a query using the GROUP BY clause to group data in one column and multiple columns 2.6 create a query using built-in functions 2.7 use nested built-in functions in a query 2.8 limit the columns or rows retrieved by a query by use of the HAVING clause 2.9 create a query containing a subquery.

Learning outcome
The learner will: 3. Manipulate data in tables
Assessment criteria
The learner can: 3.1 use the INSERT statement to • insert new rows to a table including o null values o special values o specific date values • copy rows from another table 3.2 use the UPDATE statement to update rows in a table and update rows based on another table 3.3 use the DELETE statement to delete rows from a table and rows based on another table 3.4 create and write scripts.

Learning outcome
The learner will: 4. Create and manage tables, views and indexes
Assessment criteria
The learner can: 4.1 create a table and view 4.2 alter a view definition 4.3 drop a view and a table 4.4 rename and truncate a table 4.5 insert, update, retrieve and delete data using a view 4.6 create and maintain constraints 4.7 create and maintain an index.

Learning outcome
The learner will: 5. Control user access
Assessment criteria
The learner can: 5.1 identify the commands used to control user access.

Unit 390 IT consulting skills

UAN:	**Y/502/1116**
Level:	3
Credit value:	8
GLH:	60
Aim:	The aim of this unit is to enable learners to identify the key characteristics, techniques and methods associated with successful consulting skills. To practice those skills whilst engaging with internal or external clients in all stages of the consulting cycle to bring about change in an organisation.

Learning outcome
The learner will: 1. Understand the role that the consultant plays in helping to bring about technology driven organisational change
Assessment criteria
The learner can: 1.1 identify the process by which change projects are initiated, managed and delivered in an organisation 1.2 identify how key business functions in an organisation determine IT needs 1.3 select ways in which key business functions interact with IT providers to deliver the required services 1.4 identify the types of behaviours influencing, rapport building, facilitating requirements definition 1.5 select and use the most appropriate communication style in a given situation 1.6 select appropriate techniques to meet the differing needs of various user groups.

Learning outcome
The learner will: 2. Structure a client assignment and specify the key management deliverables involved
Assessment criteria
The learner can: 2.1 use a consulting cycle to structure a client assignment to deliver an IT system 2.2 produce and agree a statement of work for the assignment – business outcomes, products to be delivered 2.3 construct an outline plan of work for the assignment 2.4 negotiate, agree and document quality acceptance criteria for the conduct of the assignment 2.5 identify key stakeholders and actions to engage them.

Learning outcome
The learner will: 3. Capture, document and present back the functional requirements of business users
Assessment criteria
The learner can: 3.1 construct a set of outcome focused objectives for a given IT system 3.2 draw a process flow diagram for a business problem 3.3 present a process flow diagram to an audience 3.4 capture key performance metrics that must be achieved by the new business process 3.5 define a set of user acceptance criteria for the products and services to be delivered.

Learning outcome
The learner will: 4. Agree and document the manner in which the success of an assignment will be judged
Assessment criteria
The learner can: 4.1 construct a set of acceptance criteria for an assignment 4.2 select quality procedures appropriate for the type of work to be conducted 4.3 identify the costs and the benefits associated with a given scenario 4.4 construct a business case for the new IT system 4.5 build a benefits realisation plan for the deployment of a new IT system.

Learning outcome
The learner will: 5. Use standard techniques to plan and control the work involved in producing the products associated with a consulting assignment
Assessment criteria
The learner can: 5.1 construct a product breakdown structure for an assignment 5.2 decompose a product breakdown structure to produce a list of tasks that must be performed 5.3 identify the critical dependencies between tasks 5.4 formulate a schedule of work from a list of tasks and an understanding of the dependencies between those tasks 5.5 prioritise work to achieve agreed delivery schedules.

Learning outcome
The learner will: 6. Manage the client during an assignment and develop an appreciation of the challenges faced when dealing with difficult clients
Assessment criteria
The learner can: 6.1 communicate concisely the proposed method of achieving the required business solution 6.2 negotiate with the client the phasing of deliverables to enable the early achievement of business benefit 6.3 agree the nature, frequency and content of progress reporting to build client confidence and reduce potential risk and exposure 6.4 agree the tolerances within which the consultant can operate without need for escalation to higher decision making 6.5 apply appropriate questioning techniques at different stages of the assignment to elicit information whilst building rapport 6.6 match communication style to the purpose at hand when communicating.

Unit 391 The technologies of the Internet

UAN:	**R/502/1115**
Level:	3
Credit value:	6
GLH:	60
Aim:	The aim of this unit is to enable learners to understand the principles and the technologies that allow the Internet to function and how different types of communications take place. The learner will also learn about securing communications and will develop the skills required to understand how to create, support and maintain the environment that enables the Internet in Windows systems.

Learning outcome
The learner will: 1. Be able to explain the concepts behind the Internet, its history and purpose
Assessment criteria
The learner can: 1.1 use an RFC search engine 1.2 interpret internet related Requests for Comments 1.3 search the world wide web (www) using different types of search engine 1.4 search the Internet using specialist search engines for locating news archives, FTP servers, media files, usenet 1.5 optimise an internet search.

Learning outcome
The learner will: 2. Know the technologies that allow communication across the Internet
Assessment criteria
The learner can: 2.1 use Transmission Control Protocol/Internet Protocol (TCP/IP) diagnostic utilities 2.2 run a command prompt 2.3 use the IPCONFIG diagnostic tool 2.4 use the /all switch of IPCONFIG to find out additional network information 2.5 use the network utility PING 2.6 look at a routing table and understand the results 2.7 analyse the results of using the TRACERT utility with IP results to route to another address 2.8 use TRACERT to test a route to one of the global name servers 2.9 compare the results of TRACERT tests and understand the significance of the information 2.10 install a graphical application for displaying route information 2.11 use the command prompt 2.12 analyse the setup of a DNS client 2.13 set a DNS connection to a domain name server 2.14 analyse the results of using the TRACERT utility with domain name results to route to another address 2.15 use the NSLOOKUP utility to obtain information from IP addresses and domain names 2.16 use the NSLOOKUP utility to do a reverse lookup 2.17 evaluate some web-based services providing 'whois' lookups 2.18 evaluate a web-based facility for investigating download times 2.19 formulate solutions for connectivity strategies in different scenarios taking into account.

Learning outcome
The learner will: 3. Be able to explain the technologies behind the World Wide Web and how to make information available
Assessment criteria
The learner can: 3.1 use a text editor to create an HTML page 3.2 save a file in the root folder structure of a web server 3.3 use a web browser to access a HTML page with a HTTP connection 3.4 start a non-graphical browser 3.5 simulate the interactions between a browser and server using a non-graphical browser 3.6 create a connection to the web server using the correct port 3.7 request a non-graphical browser page from the web server using Telnet 3.8 analyse the header response from the web server 3.9 analyse the response data from the web server 3.10 request a different type of resource from the web server 3.11 compare the settings of different browsers 3.12 analyse the results of changing browser settings 3.13 show the effects of adding plug-ins to a browser 3.14 evaluate the issues relating to non-desktop browsing environments 3.15 use an HTML editor.

Learning outcome
The learner will: 4. Understand the additional services available on the Internet, their function and use
Assessment criteria
The learner can: 4.1 identify and locate a relevant news server 4.2 install and use a newsreader application 4.3 configure the newsreader application to attach to a news server 4.4 specify the requirements for the creation of a news server account 4.5 modify account information and attach to a public news server 4.6 extract newsgroup messages 4.7 use a newsgroup reading facility with a web front end 4.8 locate public file repositories 4.9 use the browser to download a file with FTP 4.10 explore different options for finding FTP servers 4.11 install and use a graphical FTP application 4.12 select different predefined FTP servers and analyse their files 4.13 use Telnet to connect to a mail server using 4.14 Simple Mail Transfer Protocol (SMTP) 4.15 create an email message by manually typing the required SMTP commands and send the message 4.16 use Telnet to connect to a mail server using Post Office Protocol (POP) 4.17 issue the commands necessary to retrieve an email message from a specified account 4.18 identify different web-based email applications 4.19 analyse the results of an auto responder by sending an email to an automated system.

Learning outcome
The learner will: 5. Understand the security implications of making information available on the Internet
Assessment criteria
The learner can: 5.1 install and configure a software Firewall application 5.2 analyse the responses to application requests 5.3 make decisions concerning the acceptability of application requests 5.4 appraise the applications' response to different types of internet communications 5.5 issue ICMP requests and demonstrate how to block relevant packets 5.6 create a trust relationship 5.7 produce a diagram showing the structure of a secure communication.

Unit 393 Communications workshop practice

UAN:	**L/602/4637**
Level:	3
Credit value:	10
GLH:	60
Aim:	The aim of this unit is to enable learners to work safely in a communications workshop to manufacture electrical cable connections.

Learning outcome
The learner will: 1. Know the health and safety precautions and procedures within an engineering workshop environment
Assessment criteria
The learner can: 1.1 describe safe workshop working practices 1.2 describe the emergency procedures to be taken in the event of a fire, a chemical spillage and an injury.

Learning outcome
The learner will: 2. Be able to use tool husbandry and control methods in a workshop environment
Assessment criteria
The learner can: 2.1 describe and apply tool control procedures when carrying out a communications workshop fitting task 2.2 describe and apply tool care methods for different types of tools.

Learning outcome
The learner will: 3. Be able to manufacture support plates to hold cables
Assessment criteria
The learner can: 3.1 select and use tools to manufacture a metal support plate to a given standard to hold a connector and cable.

Learning outcome
The learner will: 4. Be able to manufacture electrical cable connections
Assessment criteria
The learner can: 4.1 select and use appropriate tools to manufacture different types of electrical cable connections.

Unit 394 Health and safety in the engineering workplace

UAN:	**T/600/0249**
Level:	3
Credit value:	10
GLH:	60
Aim:	The aim of this unit is to provide learners with the knowledge and understand to work safely in an engineering workplace. They will gain an understanding of legislation, the control of hazards, reporting procedures for accidents and incidents and be able to a carry out a risk assessment.

Learning outcome
The learner will: 1. Understand the key features of health and safety legislation and regulations
Assessment criteria
The learner can: 1.1 explain the key features of relevant regulations on health and safety as applied to a working environment in two selected or given engineering organisations 1.2 describe the roles and responsibilities under current health and safety legislation and regulations, of those involved.

Learning outcome
The learner will: 2. Know how to identify and control hazards in the workplace
Assessment criteria
The learner can: 2.1 describe the methods used to identify hazards in a working environment 2.2 describe how hazards which become risks can be controlled.

Learning outcome
The learner will: 3. Be able to carry out a risk assessment, identifying control measures
Assessment criteria
The learner can: 3.1 carry out a risk assessment on a typical item/area of the working environment 3.2 suggest suitable control measures after a risk assessment has been carried out and state the reasons why they are suitable.

Learning outcome
The learner will: 4. Understand the methods used when reporting and recording accidents and incidents
Assessment criteria
The learner can: 4.1 explain the principles that underpin reporting and recording accidents and incidents 4.2 describe the procedures used to record and report accidents, dangerous occurrences or near misses.

Unit 414 Systems architecture

UAN:	**A/601/3505**
Level:	4
Credit value:	10
GLH:	80
Aim:	The purpose of this unit is to provide learners with an understanding of the architecture and components used in a computer system. On completion of this unit learners will have a fuller understanding of hardware and software architectures and could enable progression to further systems support units such as Windows Internals.

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 Explain how **number systems** and **data representation** are used to store information in a computer 1.2 Explain the role of **input, output and storage devices** 1.3 Describe the characteristics of C.P.U. components and the operation of the Fetch Execute Cycle 1.4 Describe the operation of a peripheral device, controller hardware and physical connection using correct technical terminology and reference to relevant standards

Range
Number systems Denary; Hexadecimal; Binary and Octal **Data representation** Converting between number bases; Boolean Logic; truth tables; logic gates; coding of data; types of data **Input, output and storage devices** I/O Maps; Direct memory; ROM; Cache; RAM; Static; dynamic

Learning outcome
The learner will: 2. Use and develop the operating environment of current computer systems
Assessment criteria
The learner can: 2.1 Use and configure **operating system interfaces and functions** 2.2 Explain the role of **process management and concurrent processes** in computer operating systems 2.3 Describe how operating system features can contribute to data and system security

Range
Operating system interfaces and functions Modifications to suite user need; log ins; file systems; directory services **Process management and concurrent processes** Processes and threads; Main memory; File sytems; I/O; Protection and security

Learning outcome
The learner will: 3. Understand the communication process in distributed operating systems and computer networks
Assessment criteria
The learner can: 3.1 Describe the function and operation of **distributed operating systems** 3.2 Describe the functions of data communications systems in enabling network and distributed systems

Range
Distributed operating systems Filing; Automation; storage

Learning outcome
The learner will: 4. Understand distributed applications and transaction processing in mainframe systems
Assessment criteria
The learner can: 4.1 Describe the operation and functions of mainframe systems 4.2 Describe the evolution of and characteristics of distributed applications 4.3 Describe data and process distribution 4.4 Explain **distribution and transaction transparency**

Range
Distribution and transaction transparency ISO; Reference model of open distributed processing

Unit 437 Business intelligence

UAN:	**T/506/8167**
Level:	4
Credit value:	15
GLH:	66
Aim:	The aim of this unit is to provide learners with an understanding of how technologies are used to deliver Business Intelligence (BI) software solutions. Learners will be able to design, create, implement and test BI solutions including associated reporting.

Learning outcome
The learner will: 1. Understand Business Intelligence (BI) system
Assessment criteria
The learner can: 1.1 Examine the **characteristics** of a Business Intelligence (BI) system 1.2 State the rationale for using Business Intelligence (BI) systems

Range
Characteristics Online Analytical Processing (OLAP), multi-dimensional modelling, data warehouse, Extract Transform Load (ETL), reporting.

Learning outcome
The learner will: 2. Be able to design Business Intelligence solutions
Assessment criteria
The learner can: 2.1 Produce a data mapping document for the Extract Transform and Load (ETL) process 2.2 Design Extract Transform and Load (ETL) methods to prepare data for Business Intelligence systems 2.3 Design the Online Analytical Processing (OLAP) cube, specifying dimensions and measures

Learning outcome
The learner will: 3. Be able to implement Business Intelligence solutions
Assessment criteria
The learner can: 3.1 Create a data warehouse according to design documentation 3.2 Create Extract Transform and Load (ETL) methods according to data mapping document 3.3 Use Extract Transform and Load (ETL) methods to populate a data warehouse 3.4 Implement reporting according to a specification

Learning outcome
The learner will: 4. Be able to test and document Business Intelligence solutions
Assessment criteria
The learner can: 4.1 Develop a test plan to evaluate whether the implementation of the Business Intelligence solution meets the design brief 4.2 Execute a test plan to generate test log 4.3 Critically review the Business Intelligence solution developed

Unit 438 Test-driven development

UAN:	**F/506/8169**
Level:	4
Credit value:	17
GLH:	56
Aim:	The aim of this unit is to provide learners with an understanding of how Test-driven Development techniques are used in programming. Learners will be able to create and implement solutions to problems using Test-driven Development.

Learning outcome
The learner will: 1. Understand the principles of Unit Testing and Test-driven Development.
Assessment criteria
The learner can: 1.1 Explain the **principles of Unit Testing** 1.2 Evaluate the **principles and benefits of Test-driven Development** as a software development methodology 1.3 Explain the Test-driven Development **life cycle**.

Range
Principles of Unit Testing Automated, repeatable, isolated, self-validating. **Principles and benefits of Test-driven Development** Test first programming, automated testing, encourage simple design, minimise code bloat, keep developer focused on specific requirements, refactoring to acceptable standards, refactoring with confidence. **Life cycle** Get requirement - write test - compile fails - write minimum to compile - run test - test fails - write minimum for test to pass - refactor - repeat with next requirement.

Learning outcome
The learner will: 2. Understand Test-driven Development techniques.
Assessment criteria
The learner can: 2.1 Select and use the **tools** required for Test-driven Development 2.2 Critically analyse the **design patterns** that can be used for Test-driven Development.

Range
Tools Unit testing framework (eg xUnit, jUnit, nUnit, MSTest etc.), setup, teardown, assertions, exception handling, stubs and mocking frameworks. **Design Patterns** Dependency injection: constructor injection, property/setter injection, factory pattern, inheritance (extract and override). Stubs: manually, external framework. Mocks.

Learning outcome
The learner will: 3. Be able to implement a Test-driven Development solution.
Assessment criteria
The learner can: 3.1 Implement a solution to a given problem using Test-driven Development 3.2 Explain **dependencies** to a given problem 3.3 Implement a solution to a problem to deal with identified dependencies 3.4 Make effective use of an Integrated Development Environment (IDE), including code and screen templates.

Range
Dependencies Database, file system, time of day, email system, external web service.

Learning outcome
The learner will: 4. Be able to test and evaluate a solution using Test-driven Development.
Assessment criteria
The learner can: 4.1 **Test** a solution to a given problem built using Test-driven Development 4.2 Critically **review** a solution to a problem built using Test-driven Development.

Range
Test Range testing, exception, code coverage, external dependencies, refactoring. **Review** Trivial tests, severe/brittle tests, difference between mocks and stubs, test first approach.

Unit 608 Fundamentals of Linux based operating systems

UAN:	**R/507/0184**
Level:	3
Credit value:	7
GLH:	40
Aim:	This unit has been designed to help a learner build an understanding and skills needed to work with Linux in these topics: commands, system architecture, file system hierarchy, installation and package management. On successful completion of this unit a learner will be able to perform straightforward administrative tasks including executing backup and restore and shutdown and reboot. This unit is linked to the CompTIA Linux+

Learning outcome
The learner will: 1. Be able to operate Linux based operating systems.
Assessment criteria
The learner can: 1.1 determine hardware settings 1.2 configure hardware settings 1.3 boot the system 1.4 change run levels 1.5 shut down the system 1.6 reboot the system.

Learning outcome
The learner will: 2. Be able to use package management.
Assessment criteria
The learner can: 2.1 design hard disk layout 2.2 install a boot manager 2.3 manage shared libraries 2.4 use package management

Learning outcome
The learner will: 3. Be able to use Linux based operating system commands.
Assessment criteria
The learner can: 3.1 use shell commands 3.2 process text streams using filters 3.3 perform file management 3.4 use pipes 3.5 use streams 3.6 use redirects 3.7 create processes 3.8 monitor processes 3.9 kill processes 3.10 modify process execution priorities 3.11 search text files using regular expressions 3.12 perform basic file editing operations.

Learning outcome
The learner will: 4. Be able to manage files.
Assessment criteria
The learner can: 4.1 create file systems 4.2 create partitions 4.3 maintain the integrity of file systems 4.4 control file systems 4.5 manage disk quotas 4.6 manage file permissions 4.7 create links 4.8 modify links 4.9 locate files.

Unit 609 Implementing and maintaining cloud technologies and infrastructure

UAN:	**Y/507/0185**
Level:	3
Credit value:	10
GLH:	50
Aim:	This unit develops in learners the knowledge and skills required to understand standard Cloud terminologies and methodologies and to implement, maintain, and deliver cloud technologies and infrastructures. Learners will develop an understanding of aspects of IT security and use of industry best practices related to cloud implementations and the application of virtualisation. It is recommended that learners have prior learning related to cloud technologies or have experience of working in a networking role. Familiarity with any major hypervisor technologies for server virtualisation, would also be helpful. This unit covers the content of CompTIA Cloud+.

Learning outcome
The learner will: 1. Understand cloud concepts
Assessment criteria
The learner can: 1.1 compare cloud services 1.2 compare cloud delivery models 1.3 summarise cloud characteristics 1.4 define cloud terminology 1.5 explain object storage concepts.

Learning outcome
The learner will: 2. Be able to create a cloud infrastructure
Assessment criteria
The learner can: 2.1 explain the differences between hypervisor types 2.2 compare virtual components used to construct a cloud environment 2.3 explain the benefits of virtualised cloud environment 2.4 compare storage technologies 2.5 explain storage configuration concepts 2.6 explain the benefits offered by network optimisation 2.7 explain cloud network **infrastructure** 2.8 explain **hardware** used to enable virtual environments 2.9 configure storage provision 2.10 configure network for cloud services 2.11 troubleshoot network connectivity issues.

Range
infrastructure (protocols, ports, topologies) **hardware** (resources, features)

Learning outcome
The learner will: 3. Be able to manage networks associated with cloud computing
Assessment criteria
The learner can: 3.1 explain how **security** is implemented in networks associated with cloud computing 3.2 compare encryption technologies 3.3 compare encryption methods 3.4 identify access control methods 3.5 implement resource monitoring techniques 3.6 allocate **resources** 3.7 implement **hardening techniques** 3.8 use remote access tools 3.9 compare **disaster recovery** 3.10 describe situations which would impact on the availability of the cloud 3.11 describe solutions to meet availability requirements.

Range
security (network, storage) **resources** (physical, virtual) **hardening techniques** (guest and host) **disaster recovery** (methods, concepts)

Learning outcome
The learner will: 4. Be able to undertake systems management
Assessment criteria
The learner can: 4.1 explain **cloud systems management** 4.2 explain the factors that affect **system performance** 4.3 test cloud services deployment 4.4 diagnose physical host performance issues 4.5 optimise physical host performance.

Range
cloud systems management (procedures, policies) **system performance** (relating to host, relating to guest)

Unit 610 Configure and manage Linux based operating systems

UAN:	**R/507/0198**
Level:	3
Credit value:	12
GLH:	71
Aim:	This unit relates to the Linux operating system. It develops in learners the skills needed to work at a junior level as a Linux administrator. This includes shells, scripting and data management, performing straightforward administrative tasks including managing user and group accounts and securing data. Learners will gain knowledge of networking fundamentals and how to connect a workstation to a LAN or a stand-alone PC via a modem to the Internet. Learners are advised to take this unit together with *Fundamentals of Linux based operating systems*. This unit covers the content of CompTIA Linux+

Learning outcome
The learner will: 1. Be able to use shell scripting.
Assessment criteria
The learner can: 1.1 customise the shell environment 1.2 use the shell environment 1.3 write simple scripts 1.4 customise simple scripts 1.5 use Structured Query Language (SQL) commands.

Learning outcome
The learner will: 2. Be able to configure a user interface.
Assessment criteria
The learner can: 2.1 install a user interface 2.2 configure a user interface 2.3 setup a display manager 2.4 configure accessibility.

Learning outcome
The learner will: 3. Be able to administer systems
Assessment criteria
The learner can: 3.1 manage user and group accounts 3.2 manage account system files 3.3 schedule system administration tasks 3.4 configure localisation 3.5 configure internationalisation **guidance** translations/language.

Learning outcome
The learner will: 4. Be able to manage system services
Assessment criteria
The learner can: 4.1 maintain system time 4.2 implement system logging 4.3 configure Mail Transfer Agent (MTA) 4.4 manage printers.

Learning outcome
The learner will: 5. Be able to configure networks
Assessment criteria
The learner can: 5.1 describe network masks 5.2 compare private and public IP addresses 5.3 set a default route 5.4 identify services related to **ports** 5.5 describe differences between UDP, TCP and ICMP 5.6 describe differences between IPv4 and IPv6 5.7 configure network interfaces 5.8 troubleshoot networks 5.9 configure client-side Domain Name Services (DNS).

Range
ports (20, 21, 22, 23, 25, 53, 80,110, 119, 139, 143, 161, 443, 465, 993, 995)

Learning outcome
The learner will: 6. Be able to secure networks
Assessment criteria
The learner can: 6.1 maintain network security 6.2 setup host security 6.3 secure data with encryption.

Unit 611 Implement and manage a network

UAN:	**F/507/0200**
Level:	3
Credit value:	10
GLH:	58
Aim:	Through this unit, learners will gain theoretical understanding of networking concepts and procedures for implementing and managing networks. They will develop skills needed to implement a defined network architecture with basic network security. On successful completion of this unit, learners should be able to configure, maintain and troubleshoot network devices using appropriate network tools. They will be able to make basic solution recommendation, analyse network traffic and be familiar with common protocols and media types. It is recommended that learners have achieved a qualification related to IT fundamentals or have some experience of working with networks. This unit covers the content of CompTIA Network+.

Learning outcome
The learner will: 1. Understand networking concepts
Assessment criteria
The learner can: 1.1 compare layers of OSI with layers of TCP/IP models 1.2 identify the OSI model layer that is associated with different **services** 1.3 explain the purpose IP addressing 1.4 explain the properties of IP addressing 1.5 explain the purpose of routing and switching 1.6 explain the properties of routing and switching 1.7 identify default ports 1.8 explain the function of networking protocols 1.9 summarise Domain Naming Service (DNS) **concepts** 1.10 identify virtual network components 1.11 explain the purpose of Dynamic Host Control Protocol (DHCP) 1.12 explain the properties of DHCP.

Range
services (applications, devices and protocols **concepts** (DNS servers, DNS records, dynamic DNS)

Learning outcome
The learner will: 2. Be able to implement networks
Assessment criteria
The learner can: 2.1 configure routers and switches 2.2 configure a wireless network 2.3 troubleshoot wireless problems 2.4 troubleshoot router and switch problems 2.5 plan a Small Office Home Office (SOHO) network 2.6 implement a SOHO network

Learning outcome
The learner will: 3. Understand network infrastructure
Assessment criteria
The learner can: 3.1 match standard connector types to associated network media 3.2 compare wireless standards 3.3 compare Wide Area Network (WAN) technologies 3.4 describe network topologies 3.5 compare Local Area Network (LAN) technologies 3.6 identify components of wiring distribution

Learning outcome
The learner will: 4. Be able to manage networks
Assessment criteria
The learner can: 4.1 explain the features of network technologies 4.2 describe a network troubleshooting methodology 4.3 troubleshoot connectivity issues 4.4 use network monitoring resources 4.5 describe the purpose of configuration management documentation 4.6 explain methods of network performance optimisation

Learning outcome
The learner will: 5. Be able to secure networks
Assessment criteria
The learner can: 5.1 explain threats and vulnerabilities of networks 5.2 explain methods of user authentication 5.3 describe types of network security technologies 5.4 describe types of network security methods 5.5 explain how network threats and vulnerabilities are mitigated 5.6 implement wireless security measures 5.7 configure a basic firewall.

Unit 611 Implement and manage a network

Supporting information

Evidence requirements

For 4.3 you are required to use hardware tools and software tools

Unit 612 Securing ICT systems and networks

UAN:	**D/507/0219**
Level:	3
Credit value:	9
GLH:	51
Aim:	Learners will gain theoretical understanding of concepts and procedures for securing both ICT systems and networks. They will learn to identify risk and how to participate in risk mitigation activities, provide infrastructure, application, operational and information security and apply security controls to maintain confidentiality, integrity and availability. In addition, learners will gain knowledge of applicable policies, laws and regulations and the implications of these to their activities. This unit is of most benefit to individuals with prior learning related to IT security or experience of working in IT administration. This unit is linked to the CompTIA Security+ Exam.

Learning outcome
The learner will: 1. Be able to implement network security
Assessment criteria
The learner can: 1.1 implement security **configuration parameters** 1.2 use network **administration principles** 1.3 explain **network design** 1.4 implement common protocols 1.5 implement common services 1.6 troubleshoot security issues related to wireless networking.

Range
configuration parameters (on network devices, on other technologies) **administration principles** (rule-based management, firewall rules, VLAN management, secure router configuration, access control lists, port security, 802.1x, floor guards, loop protection, implicit deny, prevent network bridging by network separation, log analysis) **network design** (elements, components)

Learning outcome
The learner will: 2. Be able implement operational security in an ICT environment
Assessment criteria
The learner can: 2.1 explain the importance of risk related concepts 2.2 summarise the security implications of integrating systems with third parties 2.3 implement risk mitigation strategies 2.4 implement forensic procedures 2.5 summarise incident response procedures 2.6 explain the importance of security awareness and training 2.7 explain physical security 2.8 explain **environmental controls** 2.9 summarise risk management best practices 2.10 select controls to meet security goals.

Range
environmental controls (HVAC, fire suppression, EMI shielding, hot and cold aisles, environmental monitoring, temperature and humidity controls, video monitoring)

Learning outcome
The learner will: 3. Be able to discover threats and vulnerabilities
Assessment criteria
The learner can: 3.1 explain types of malware 3.2 explain types of attacks 3.3 summarise social engineering attacks 3.4 summarise effectiveness of social engineering attacks 3.5 select mitigation and deterrent techniques 3.6 use techniques to discover security threats and vulnerabilities 3.7 compare the proper use of penetration testing and vulnerability scanning.

Learning outcome
The learner will: 4. Be able to implement data host security
Assessment criteria
The learner can: 4.1 explain the importance of application security controls 4.2 summarise **mobile security** 4.3 select solution to establish host security 4.4 implement controls to ensure data security 4.5 compare measures for mitigating security risks in static environments.

Range
mobile security (concepts and technologies)

Learning outcome
The learner will: 5. Be able to configure access control
Assessment criteria
The learner can: 5.1 explain function of authentication services 5.2 select access control method to meet requirements 5.3 configure account management security controls.

Learning outcome
The learner will: 6. Be able to implement cryptography
Assessment criteria
The learner can: 6.1 use cryptography techniques 6.2 use cryptographic methods 6.3 use Public Key **Infrastructure** (PKI).

Range
infrastructure (certificate management and associated components)

Unit 613 Install and configure a server

UAN:	**Y/507/0221**
Level:	3
Credit value:	9
GLH:	48
Aim:	This unit develops in learners the knowledge and skills required to build, maintain, troubleshoot and support server hardware and software technologies. Successful completion of the unit will enable learners to identify environmental issues; understand and comply with disaster recovery and security procedures and be familiar with industry terminology and concepts. This unit covers the content for CompTIA Server+.

Learning outcome
The learner will: 1. Be able to install system hardware
Assessment criteria
The learner can: 1.1 explain the importance of a Hardware Compatibility List (HCL) 1.2 select **hardware components** 1.3 install hardware components into a server 1.4 configure firmware.

Range
hardware components (system boards, chassis, memory, processors, expansion cards)

Learning outcome
The learner will: 2. Be able to implement Network Operating System (NOS) software
Assessment criteria
The learner can: 2.1 explain features of NOS security software 2.2 explain the interaction of server roles 2.3 describe **server virtualisation** 2.4 install NOS 2.5 deploy NOS 2.6 configure NOS 2.7 update NOS 2.8 implement NOS management features 2.9 select controls to meet security goals.

Range
server virtualisation (concepts, features, considerations)

Learning outcome
The learner will: 3. Be able to configure storage
Assessment criteria
The learner can: 3.1 describe features of Redundant Array of Independent Disks (RAID) technologies 3.2 describe benefits of RAID technologies 3.3 select a RAID level 3.4 configure internal storage technologies 3.5 explain the purpose of external storage technologies.

Learning outcome
The learner will: 4. Be able to implement server access
Assessment criteria
The learner can: 4.1 describe **elements** of networking essentials 4.2 create **system information** 4.3 utilise system information 4.4 maintain system information 4.5 determine a physical environment for a server location 4.6 describe physical security measures for a server location 4.7 describe methods of server access 4.8 implement server access 4.9 configure server access.

Range
elements (TCP/IP, Ethernet, VPN, VLAN, DMZ) **system information** (documentation, diagrams and procedures)

Learning outcome
The learner will: 5. Be able to implement disaster recovery
Assessment criteria
The learner can: 5.1 compare backup and restoration methodologies 5.2 compare backup and restoration media types 5.3 compare types of replication methods 5.4 explain data retention and destruction concepts 5.5 implement the steps of a recovery plan.

Learning outcome
The learner will: 6. Be able to troubleshoot server problems
Assessment criteria
The learner can: 6.1 explain troubleshooting methodologies 6.2 diagnose network problems 6.3 troubleshoot hardware problems 6.4 troubleshoot software problems 6.5 troubleshoot storage problems.

Unit 614 Implement and manage a mobile computing environment

UAN:	**K/507/0224**
Level:	3
Credit value:	8
GLH:	47
Aim:	This unit enables learners to develop the knowledge and skills required to understand and research capabilities of mobile devices and features of over-the-air technologies. Successful learners will also develop the skills needed to deploy, integrate, support and manage a mobile environment ensuring proper security measures are implemented for devices and platforms while maintaining usability. It is recommended that learners taking this unit have prior learning related to networking or have experience of working in IT administration.

Learning outcome
The learner will: 1. Be able to implement over-the-air technologies
Assessment criteria
The learner can: 1.1 compare cellular technologies 1.2 compare Radio Frequency (RF) principles 1.3 compare RF functionality 1.4 interpret site survey for over the air communication issues 1.5 configure WiFi client technologies.

Learning outcome
The learner will: 2. Understand network infrastructure
Assessment criteria
The learner can: 2.1 compare physical and **logical infrastructure** 2.2 describe network ports associated with mobile devices 2.3 describe network protocols associated with mobile devices 2.4 explain the technologies used for negotiating wireless to wired networks 2.5 explain the layers of the OSI model 2.6 explain disaster recovery principles 2.7 explain how disaster recovery affects mobile devices.

Range
logical infrastructure (technologies, protocols)

Learning outcome
The learner will: 3. Be able to manage mobiles devices
Assessment criteria
The learner can: 3.1 explain policies required to certify device capabilities 3.2 compare mobility solutions to enterprise requirements 3.3 configure mobile solutions to meet requirements 3.4 implement **mobile devices** 3.5 describe emerging technologies in mobile computing 3.6 configure mobile applications 3.7 deploy mobile applications.

Range
mobile devices (procedures, operations)

Learning outcome
The learner will: 4. Understand mobile security issues
Assessment criteria
The learner can: 4.1 identify encryption methods for securing mobile environments 4.2 configure access control on mobile devices 4.3 explain techniques used to address security requirements 4.4 explain how risks and threats to the mobile ecosystem are mitigated 4.5 implement **data integrity** on mobile devices 4.6 execute incident response steps

Range
data integrity (device backup, data recovery and data segregation)

Learning outcome
The learner will: 5. Be able to troubleshoot mobile problems
Assessment criteria
The learner can: 5.1 troubleshoot device problems 5.2 troubleshoot application problems 5.3 troubleshoot over-the-air connectivity problems 5.4 troubleshoot security problems 5.5 implement the steps of a recovery plan.

Unit 615 Developing security for mobile apps on iOS

UAN:	**J/507/0229**
Level:	3
Credit value:	14
GLH:	77
Aim:	This unit is for those with experience of app development and familiarity with the iOS SDK and principles of secure application development. It will develop learners' knowledge of the fundamental principles of application security, the security model of iOS devices, Web services security model and vulnerabilities and common implementations of cryptography. Learners will develop skills needed to develop moderately complex applications using the iOS SDK, use the security features of the iOS operating system and APIs, implement secure coding techniques and harden an application against attack to levels appropriate for the risk model of the application.

Learning outcome
The learner will: 1. Understand application security
Assessment criteria
The learner can: 1.1 identify legislation for secure mobile development 1.2 describe security risks for mobile technologies 1.3 compare the relative severity of mobile security issues 1.4 explain a secure application development process 1.5 summarise application security best practices 1.6 identify the major architectural risks of weaknesses in an application

Learning outcome
The learner will: 2. Understand Objective-C coding
Assessment criteria
The learner can: 2.1 explain factors that should be considered when designing apps using Objective-C language 2.2 manage sensitive data in memory 2.3 explain Objective-C framework paradigms 2.4 explain Objective-C framework security impacts 2.5 identify code that gives correct interaction with iOS security facilities and objects

Learning outcome
The learner will: 3. Understand application security features
Assessment criteria
The learner can: 3.1 summarise the security features of the platform 3.2 explain the data protection Application Programming Interface (API) 3.3 explain the features of the security framework 3.4 explain the security of the keychain 3.5 explain the limitations of the keychain 3.6 use keychain for storing sensitive data

Learning outcome
The learner will: 4. Understand network security
Assessment criteria
The learner can: 4.1 summarise the risks in performing Web and network communications 4.2 implement a Secure Socket Layer (SSL) session with validation 4.3 explain threats to Web services 4.4 distinguish security protections for authentication 4.5 describe proper implementation of session security

Learning outcome
The learner will: 5. Understand data security
Assessment criteria
The learner can: 5.1 explain a secure data storage and encryption implementation 5.2 describe implementation of encryption in iOS to ensure data security 5.3 describe Apple Data Encryption APIs 5.4 explain how data is deleted securely 5.5 explain data recovery techniques for iOS 5.6 explain types of data 5.7 explain sensitivity of data 5.8 explain how data can leak

Learning outcome
The learner will: 6. Understand application hardening
Assessment criteria
The learner can: 6.1 explain application object binaries 6.2 explain application tools 6.3 explain Objective-C debugging 6.4 describe forms of abusive runtime manipulation 6.5 summarise counter-runtime abuse techniques

Unit 616 Developing security for mobile apps on android

UAN:	**T/507/0226**
Level:	3
Credit value:	13
GLH:	73
Aim:	This unit is for those with experience of app development and familiarity with Java, the Android SDK, and principles of secure application development. It will develop learners' knowledge of the fundamental principles of application security, the security model of Android devices, Web services security model and vulnerabilities and common implementations of cryptography. Learners will develop skills needed to develop moderately complex applications using the Android SDK, use the security features of the Android operating system and APIs, implement secure coding techniques and harden an application against attack to levels appropriate.

Learning outcome
The learner will: 1. Understand application security
Assessment criteria
The learner can: 1.1 identify legislation for secure mobile development 1.2 compare the relative severity of security issues 1.3 explain a secure development process throughout application development 1.4 summarise application security best practices 1.5 identify the architectural risks to weaknesses in an application.

Learning outcome
The learner will: 2. Understand application security features
Assessment criteria
The learner can: 2.1 summarise the Android security architecture 2.2 explain the Android permission model 2.3 describe secure inter-process communication 2.4 securely implement common features.

Learning outcome
The learner will: 3. Understand network security
Assessment criteria
The learner can: 3.1 summarise the risks in performing web and network communications 3.2 implement an Secure Socket Layer (SSL) session with validation 3.3 explain threats to web services 3.4 explain protections to web services 3.5 distinguish security protections for authentication 3.6 describe proper implementation of session security.

Learning outcome
The learner will: 4. Understand data security
Assessment criteria
The learner can: 4.1 explain how encryption works 4.2 explain how hashing works 4.3 summarise methods for securing stored data 4.4 distinguish implementation of encryption in an Android application 4.5 implement data security using the Android permissions model 4.6 explain reverse engineering 4.7 explain reverse engineering countermeasures.

Learning outcome
The learner will: 5. Understand secure Java coding
Assessment criteria
The learner can: 5.1 explain Java language structure 5.2 explain object-oriented development 5.3 use techniques for dealing with sensitive information 5.4 explain secure Java coding best practices.

Unit 630 Administering server databases

UAN:	**A/507/0292**
Level:	3
Credit value:	12
GLH:	48
Aim:	This unit is intended for those who are looking to become database professionals. A learner that achieves this unit will be able to perform installation, maintenance, and configuration tasks, as well as take responsibility for aspects of other activities such as setting up database systems, ensuring systems operate efficiently, and the regular storing, backing up, and securing data from unauthorised access. This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam Administering Microsoft SQL Server Databases.

Learning outcome
The learner will: 1. Be able to install SQL Servers
Assessment criteria
The learner can: 1.1 describe the SQL Server platform 1.2 use SQL Server tools 1.3 configure SQL Server services 1.4 describe the SQL Server architecture 1.5 plan for SQL Server resource requirements 1.6 conduct pre-installation stress testing for SQL Server 1.7 install SQL Server 1.8 upgrade SQL Server 1.9 automate the installation of SQL Server.

Learning outcome
The learner will: 2. Be able to use databases
Assessment criteria
The learner can: 2.1 describe the role of SQL Server databases 2.2 describe the structure of SQL Server databases 2.3 administer files and filegroups 2.4 move database files 2.5 transfer data to and from SQL Server 2.6 optimise the bulk insert process.

Learning outcome
The learner will: 3. Be able to restore SLQ server databases
Assessment criteria
The learner can: 3.1 describe the concepts of backup strategies 3.2 explain the transaction logging capabilities 3.3 plan a SQL Server backup strategy 3.4 manage database backups 3.5 describe the restore process 3.6 restore databases 3.7 use Point-in-time Recovery.

Learning outcome
The learner will: 4. Know how to authorise users
Assessment criteria
The learner can: 4.1 describe how SQL Server authenticates connections 4.2 describe how logins are authorised to access databases 4.3 describe the requirements for authorisation across servers 4.4 authorise user access to objects 4.5 authorise users to execute code 4.6 configure permissions at the schema level 4.7 use **database server roles**.

Range
database server roles (fixed, user defined)

Learning outcome
The learner will: 5. Be able to audit SQL Server Environments
Assessment criteria
The learner can: 5.1 describe the options for auditing data access in SQL Server 5.2 implement SQL Server Audit 5.3 manage SQL Server Audit.

Learning outcome
The learner will: 6. Be able to automate SQL Server Management
Assessment criteria
The learner can: 6.1 automate SQL Server Management 6.2 use SQL Server Agent 6.3 manage SQL Server Agent jobs.

Learning outcome
The learner will: 7. Be able to configure security for SQL Server Agent
Assessment criteria
The learner can: 7.1 explain SQL Server Agent security 7.2 configure credentials 7.3 configure Proxy accounts.

Learning outcome
The learner will: 8. Be able to perform ongoing database maintenance
Assessment criteria
The learner can: 8.1 configure database mail 8.2 monitor SQL Server errors 8.3 configure operators 8.4 configure alerts 8.5 configure notifications 8.6 ensure database integrity 8.7 maintain indexes 8.8 automate routine database maintenance.

Learning outcome
The learner will: 9. Be able to use tracing options
Assessment criteria
The learner can: 9.1 capture SQL Server activity 9.2 analyse performance data 9.3 improve SQL Server performance.

Learning outcome
The learner will: 10. Be able to manage multiple servers
Assessment criteria
The learner can: 10.1 manage multiple servers 10.2 describe options for virtualising SQL Server 10.3 deploy Data-Tier Applications 10.4 upgrade Data-Tier Applications.

Learning outcome
The learner will: 11. Be able to troubleshoot SQL Server administrative issues
Assessment criteria
The learner can: 11.1 explain SQL Server troubleshooting methodology 11.2 resolve administrative **issues**.

Range
issues (service-related, concurrency, login, connectivity)

Unit 631 Administering a Windows based server

UAN:	**A/507/0289**
Level:	3
Credit value:	11
GLH:	50
Aim:	This unit provides the skills and knowledge necessary to administer a Windows based Server. A learner achieving this unit will have the ability to administer the tasks required to maintain a Windows based Server infrastructure, such as user and group management, network access, and data security. This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam for Administering Windows Server.

Learning outcome
The learner will: 1. Be able to deploy server images
Assessment criteria
The learner can: 1.1 install Windows deployment services 1.2 describe how to create operating system images 1.3 configure **Windows deployment** services.

Range
Windows deployment (incorporates custom computer naming, deployment of images, administrative tasks)

Learning outcome
The learner will: 2. Be able to manage Domain Name Systems (DNS)
Assessment criteria
The learner can: 2.1 explain how to configure DNS zones and transfers 2.2 manage **DNS.**

Range
DNS (includes installing and configuring, troubleshooting( ) server roles, zones, conditional forwarding, resource records)

Learning outcome
The learner will: 3. Be able to maintain domain controllers
Assessment criteria
The learner can: 3.1 explain the structure of directory services 3.2 describe how to implement **domain controllers** 3.3 implement domain controllers 3.4 configure directory services snapshots 3.5 describe the use of domain controller cloning.

Range
domain controllers (virtualised, read only (RODCs)) **3.3** includes configuring, implementing, administering, troubleshoot DC includes virtualised, read only (RODCs)

Learning outcome
The learner will: 4. Be able to implement a group policy infrastructure
Assessment criteria
The learner can: 4.1 configure managed **service accounts** 4.2 explain the features of group policy 4.3 implement group policy preferences 4.4 manage group policy scope 4.5 describe administrative templates 4.6 manage group **policy objects** 4.7 describe how to deploy software using group policy objects.

Range
service accounts (create, associate, password policy, account lockout) **policy objects** (create, configure, monitor, process policy, troubleshoot)

Learning outcome
The learner will: 5. Be able to manage remote access
Assessment criteria
The learner can: 5.1 manage **remote access role** in Windows 5.2 manage an **advanced remote access infrastructure** 5.3 explain web application proxy (implementation, validation).

Range
remote access role (install, configure, monitor, troubleshoot) **advanced remote access infrastructure** (installation, configuring, monitoring, validate, including VPN)

Learning outcome
The learner will: 6. Be able to manage the network server
Assessment criteria
The learner can: 6.1 describe network policy authentication methods 6.2 manage the **network policy server** 6.3 configure RADIUS clients 6.4 configure RADIUS servers 6.5 describe how network access protection can help protect a network 6.6 describe Network Access Protection enforcement processes 6.7 manage Network Access Protection.

Range
network policy server (configure troubleshoot) **network access protection** (configure troubleshoot)

Learning outcome
The learner will: 7. Be able to optimise file services
Assessment criteria
The learner can: 7.1 describe file server resource manager 7.2 configure file services 7.3 implement classification tasks 7.4 implement file management tasks 7.5 describe the components of the distributed file system 7.6 configure **distributed file systems** 7.7 encrypt files using encrypting file system EFS 7.8 configure advanced auditing features

Range
distributed file systems (namespaces replication)

Learning outcome
The learner will: 8. Be able to manage group policy
Assessment criteria
The learner can: 8.1 describe the role of Windows server update services 8.2 describe the use of monitoring tools for Windows Server 8.3 describe how to monitor events 8.4 establish a performance baseline 8.5 identify the source of a performance problem 8.6 configure centralised event logs 8.7 interpret events

Unit 632 Configuring advanced Windows server services

UAN:	**R/507/0332**
Level:	3
Credit value:	12
GLH:	52
Aim:	This unit provides the skills and knowledge necessary to administer a Windows based Server. A learner achieving this unit will have the ability to perform the advanced configuring tasks required to deploy, manage, and maintain a Windows Server Infrastructure, such as fault tolerance, certificate services, and identity federation. This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam for Configuring Advanced Windows Server Services

Learning outcome
The learner will: 1. Be able to implement advanced network services
Assessment criteria
The learner can: 1.1 configure advanced DNS services 1.2 configure advanced DHCP services 1.3 implement Internet Protocol Address Management (IPAM).

Learning outcome
The learner will: 2. Be able to implement advanced file services
Assessment criteria
The learner can: 2.1 configure Internet Small Computer Storage Interface (ISCSI) storage 2.2 configure **BranchCache** 2.3 configure the File Classification Infrastructure 2.4 monitor BranchCache 2.5 optimise storage usage.

Range
BranchCache (Main Officer Servers, Branch Officer Servers, client computers)

Learning outcome
The learner will: 3. Be able to implement Dynamic Access control.
Assessment criteria
The learner can: 3.1 plan Dynamic Access control implementation 3.2 configure **claims** 3.3 configure resource property definitions 3.4 configure **central access** 3.5 validate dynamic access controls 3.6 remediate dynamic access controls 3.7 implement resource policies.

Range
claims (user device) **central access** (rules, policies)

Learning outcome
The learner will: 4. Be able to implement directory services
Assessment criteria
The learner can: 4.1 describe distributed directory services deployments 4.2 implement a distributed directory services deployment 4.3 implement Child Domains 4.4 implement Forest Trusts 4.5 manage **directory services** 4.6 create subnets.

Range
directory services (create, configure, monitor, modify, troubleshoot, trusts, replication, sites (including default sites)

Learning outcome
The learner will: 5. Be able to implement certificate services
Assessment criteria
The learner can: 5.1 configure certificates 5.2 configure key recovery 5.3 describe the Public Key Infrastructure (PKI) 5.4 deploy a certification authority 5.5 configure the certification authority hierarchy 5.6 manage certificates.

Range
5.1 includes templates enrolment revocation **5.6** deploy, implement distribution, implement revocation, recovery

Learning outcome
The learner will: 6. Be able to implement Rights Management Services (RMS)
Assessment criteria
The learner can: 6.1 describe RMS 6.2 configure RMS 6.3 implement RMS trust policies 6.4 verify RMS deployment 6.5 deploy RMS infrastructure 6.6 manage an RMS infrastructure 6.7 configure RMS content protection 6.8 configure external access to RMS.

Learning outcome
The learner will: 7. Be able to implement Federation Services (FS)
Assessment criteria
The learner can: 7.1 describe FS 7.2 configure FS pre-requisites 7.3 configure FS 7.4 deploy FS.

Range
7.3 and 7.4 for a single organisation, for Federated business partners

Learning outcome
The learner will: 8. Be able to implement Network Load Balancing (NLB)
Assessment criteria
The learner can: 8.1 manage an NLB cluster 8.2 validate high availability for an NLB cluster.

Range
8.1 Plan, Configure, Implement, monitor

Learning outcome
The learner will: 9. Be able to implement failover clustering
Assessment criteria
The learner can: 9.1 manage a failover cluster 9.2 configure cluster-aware updating on a failover cluster 9.3 manage a highly available file server 9.4 configure a highly available failover solution 9.5 configuring a virtualised failover cluster for virtualisation 9.6 configure a Highly Available Virtual Machine 9.7 implement virtualisation of machines on failover clusters 9.8 implement virtual machine movement 9.9 manage virtual environments.

Range
9.1 includes implement, configure, maintain multi-site and single site **9.3** includes deploy, configure, validate **9.4** for services, for applications

Learning outcome
The learner will: 10. Be able to implement disaster recovery
Assessment criteria
The learner can: 10.1 describe disaster recovery 10.2 implement server recovery 10.3 implement data recovery 10.4 back up data on a Windows server 10.5 use cloud services for disaster recovery.

Unit 633 Configuring Windows based systems

UAN:	**D/507/0334**
Level:	3
Credit value:	12
GLH:	52
Aim:	This unit provides the skills and knowledge necessary to configure or support Windows based systems. A learner achieving this unit will have the ability configure or support Windows computers, devices, users, and associated network and security resources. The networks will typically be configured as domain-based or peer-to-peer environments with access to the Internet and cloud services. This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam for Configuring Windows.

Learning outcome
The learner will: 1. Be able to install Windows
Assessment criteria
The learner can: 1.1 describe the different editions of Windows 1.2 describe options for upgrading a Windows based operating system 1.3 prepare a computer for Windows installation 1.4 install a Windows operating system 1.5 automate the installation of a Windows operating system 1.6 configure device drivers 1.7 explain Windows operating system licensing and activation 1.8 customise an image for deployment 1.9 prepare an image for deployment 1.10 describe volume activation 1.11 deploy a Windows Image.

Learning outcome
The learner will: 2. Be able to manage user state
Assessment criteria
The learner can: 2.1 create User State Migration Tool (USMT) XML files 2.2 customise USMT XML files 2.3 manage user accounts 2.4 configure user state virtualisation 2.5 migrate user state 2.6 optimise storage usage.

Learning outcome
The learner will: 3. Be able to use Windows tools
Assessment criteria
The learner can: 3.1 managing Windows Using Group Policy 3.2 implement Windows remote management 3.3 describe the tools to use for Windows management 3.4 manage Windows using command line-based tools.

Guidance
3.2 this could be PowerShell Remoting 3.4 this could be Powershell

Learning outcome
The learner will: 4. Be able to configure network connections
Assessment criteria
The learner can: 4.1 configure a local area network (LAN) connection 4.2 implement automatic IP address allocation 4.3 implement name resolution 4.4 resolve network connectivity problems 4.5 implement wireless network connectivity 4.6 describe **wireless network connections.**

Range
4.1 (IPv4, IPv6) **Wireless network connections** (standards, technologies)

Learning outcome
The learner will: 5. Be able to configure resource access
Assessment criteria
The learner can: 5.1 configure domain access for Windows devices 5.2 manage non-domain devices 5.3 configure workplace join 5.4 configure work folders.

Learning outcome
The learner will: 6. Be able to secure networks
Assessment criteria
The learner can: 6.1 Describe network security threats 6.2 Mitigate threats to network security 6.3 Secure network traffic

Learning outcome
The learner will: 7. Be able to manage file access
Assessment criteria
The learner can: 7.1 manage **hard disks** 7.2 describe cloud-based storage services 7.3 manage file and folder access 7.4 manage shared folder access 7.5 configure file and folder compression 7.6 manage **printers.**

Range
hard disks (local, virtual) **printers** (local, network)

Learning outcome
The learner will: 8. Be able to secure Windows devices
Assessment criteria
The learner can: 8.1 describe methods used for authentication in Windows 8.2 describe methods used for authorization in Windows 8.3 describe how to use local Group Policy Objects (GPOs) to secure Windows 8.4 create multiple local GPOs 8.5 secure data 8.6 configure User Account Control (UAC).

Range
8.5 with EFS and with BitLocker

Learning outcome
The learner will: 9. Be able to maintain Windows client computers
Assessment criteria
The learner can: 9.1 optimise Windows performance 9.2 manage the Windows reliability 9.3 manage software updates.

Learning outcome
The learner will: 10. Be able to configure applications for Windows
Assessment criteria
The learner can: 10.1 describe application deployment options 10.2 manage apps on a Windows based operating system 10.3 configure Internet browser settings 10.4 configure application restrictions.

Learning outcome
The learner will: 11. Be able to configure remote access
Assessment criteria
The learner can: 11.1 configure Windows settings for mobile computing devices 11.2 configure Virtual Private Network (VPN) access 11.3 configure DirectAccess 11.4 configure remote desktop 11.5 configure remote assistance.

Learning outcome
The learner will: 12. Be able to configure desktop virtualisation
Assessment criteria
The learner can: 12.1 describe a client hypervisor 12.2 create virtual machines 12.3 manage virtual hard disks 12.4 manage checkpoints.

Guidance
12.1 could be Hyper-V

Learning outcome
The learner will: 13. Be able to recover a Windows based operating system
Assessment criteria
The learner can: 13.1 explain Windows recovery options 13.2 back up files 13.3 restore files.

Unit 634 Installing and configuring Windows based servers

UAN:	**H/507/0335**
Level:	3
Credit value:	11
GLH:	57
Aim:	This unit provides the skills and knowledge necessary to implement a core Windows Server infrastructure. A learner achieving this unit will have the ability to implement and configure Windows Server core services, such as Active Directory and the networking services. This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam for Installing and Configuring Windows Server

Learning outcome
The learner will: 1. Be able to deploy Windows based servers
Assessment criteria
The learner can: 1.1 describe the features of a Window based server 1.2 describe the server management **tools** 1.3 plan for a server installation 1.4 configure a server.

Range
tools (development, testing, connecting)

Learning outcome
The learner will: 2. Understand domain controllers
Assessment criteria
The learner can: 2.1 describe the structure of domain controller services 2.2 describe the purpose of domain controllers 2.3 explain how to install a domain controller.

Learning outcome
The learner will: 3. Be able to manage user accounts
Assessment criteria
The learner can: 3.1 **manage accounts** 3.2 delegate permissions 3.3 explain how to automate user account management.

Range
manage (create, configure, troubleshooting) **accounts** (user, group, computer)

Learning outcome
The learner will: 4. Be able to implement Internet Protocol (IP)
Assessment criteria
The learner can: 4.1 describe the TCP/IP protocol suite 4.2 describe **IP addressing options** 4.3 determine a **subnet mask** 4.4 configure IP options 4.5 troubleshoot IP options 4.6 describe the benefits of IPv6 4.7 describe the **interoperability** between IPv4 and IPv6.

Range
IP addressing options (IPv4, IPv6) **subnet mask** (subnetting or supernetting) **Interoperability** (Coexistence, transition)

Learning outcome
The learner will: 5. Be able to implement Dynamic Host Configuration Protocols (DHCP)
Assessment criteria
The learner can: 5.1 **configure** DHCP **server roles** 5.2 manage a DHCP database 5.3 manage the DHCP server role.

Range
configure (Also includes securing server role) **server roles** (Also includes scopes)

Learning outcome
The learner will: 6. Be able to implement Domain Name Systems (DNS)
Assessment criteria
The learner can: 6.1 install DNS server services 6.2 configure DNS 6.3 **manage** DNS.

Range
manage (also includes DNS zones, creating host records and server cache)

Learning outcome
The learner will: 7. Be able to configure server storage.
Assessment criteria
The learner can: 7.1 describe storage technologies 7.2 **configure storage** 7.3 **configure shared files and folders** 7.4 configure a printer pool.

Range
Configure storage (also includes resizing volumes, redundant storage space) **Configure shared files and folder** (a file share, shadow copies, protection, security)

Learning outcome
The learner will: 8. Be able to manage group policy
Assessment criteria
The learner can: 8.1 **manage** group policy objects 8.2 describe server operating system security 8.3 configure software application restriction policies 8.4 audit **system access.**

Range
manage (also includes creating group policy objects, implementing a central store for administrative templates, security, restrict running of unauthorised software, a firewall with advanced security) **system access** (domain logons, file system access)

Learning outcome
The learner will: 9. Be able to implement server virtualisation
Assessment criteria
The learner can: 9.1 describe virtualisation technologies 9.2 configure a virtual machine 9.3 manage virtual machine storage 9.4 **manage** virtual networks.

Range
manage (to also include configure)

Unit 634 Installing and configuring Windows based servers

Supporting information

Guidance

Configuration of any aspect of the server also requires installation

For learners to know the benefits of IPV6, they should also learn the features

1.4 this includes admin tasks.

3.3 automation should be through command line tools

Unit 635 Programming in HTML5 with JavaScript and CSS3

UAN:	**A/507/0275**
Level:	3
Credit value:	11
GLH:	43
Aim:	This unit is designed to provide an introduction to HTML5, CSS3, and JavaScript. The unit focuses on using HTML5/CSS3/JavaScript to implement programming logic, define and use variables, perform looping and branching, develop user interfaces, capture and validate user input, store data, and create well-structured application. This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam for the Programming in HTML5 with JavaScript and CSS3.

Learning outcome
The learner will: 1. Be able to create HTML5 pages
Assessment criteria
The learner can: 1.1 describe basic **HTML5** 1.2 explain the structure of Cascading Style Sheets (CSS) 1.3 describe Integrated Development Environment (IDE) tools available for building Web applications 1.4 create static pages using features of HTML5 1.5 apply styling to the elements in an HTML5 page.

Range
HTML5 (elements, attributes)

Learning outcome
The learner will: 2. Be able to code using JavaScript
Assessment criteria
The learner can: 2.1 explain the syntax of JavaScript 2.2 describe how to use JavaScript with HTML5 2.3 write JavaScript code that manipulates the HTML DOM 2.4 write JavaScript code that handles events 2.5 describe how to use jQuery to simplify code 2.6 describe the benefits of structuring JavaScript code 2.7 explain best practices for creating custom objects in JavaScript 2.8 describe how to extend objects to add functionality.

Learning outcome
The learner will: 3. Be able to create forms using HTML5
Assessment criteria
The learner can: 3.1 create forms using HTML5 3.2 validate user input using HTML5 attributes 3.3 create feedback using HTML5 attributes 3.4 write JavaScript code to validate user input.

Learning outcome
The learner will: 4. Be able to communicate with a remote data source
Assessment criteria
The learner can: 4.1 communicate data by using **XMLHttpRequest** objects 4.2 simplify code that communicates data using the jQuery ajax method.

Range
XMLHttpRequest (has member types: Events, Methods, Properties)

Learning outcome
The learner will: 5. Be able to style HTML5 by using CSS3
Assessment criteria
The learner can: 5.1 style text elements on an HTML5 page by using CSS3 5.2 apply styling to block elements by using CSS3 5.3 use CSS3 selectors to specify the elements to be styled in a Web application 5.4 implement effects by using **CSS3 properties**.

Range
CSS3 properties (graphical, transformations)

Learning outcome
The learner will: 6. Be able to create interactive pages using HTML5 Application Programming Interfaces (APIs)
Assessment criteria
The learner can: 6.1 use APIs to interact with files in a Web application 6.2 incorporate media into a **Web application** 6.3 detect the location of the user running a Web application 6.4 explain how to debug a Web application 6.5 explain how to profile a Web application.

Range
Web application (video, audio)

Learning outcome
The learner will: 7. Be able to add offline support to web applications
Assessment criteria
The learner can: 7.1 save data locally on the user's computer 7.2 retrieve data locally on the user's computer 7.3 incorporate offline support for a Web application.

Learning outcome
The learner will: 8. Be able to implement an adaptive User Interface (UI)
Assessment criteria
The learner can: 8.1 describe the need for a Web application to detect device capabilities 8.2 describe the need for a Web application to react to different form factors 8.3 create a Web page that can dynamically adapt its layout to match different form factors.

Learning outcome
The learner will: 9. Be able to create graphics
Assessment criteria
The learner can: 9.1 add interactive graphics to an **application** 9.2 draw complex graphics on an HTML5 Canvas element by using JavaScript code.

Range
application (guidance using Scalable Vector Graphics)

Learning outcome
The learner will: 10. Be able to animate the User Interface (UI)
Assessment criteria
The learner can: 10.1 describe the types of transitions available with CSS3 10.2 apply CSS transitions to elements on an HTML5 page 10.3 implement complex **animations** 10.4 write JavaScript code to detect when a transition has occurred.

Range
animations (using CSS key-frames, using JavaScript code)

Learning outcome
The learner will: 11. Be able to implement Real-Time communications by using Web sockets
Assessment criteria
The learner can: 11.1 explain how Web Sockets work 11.2 describe how to communicate data through a Web Socket 11.3 use the Web Socket API with JavaScript to **communicate** with a Web Socket server.

Range
communicate (send and receive data, and handle the different events that can occur when a message is sent or received)

Learning outcome
The learner will: 12. Be able to create a Web Worker Process
Assessment criteria
The learner can: 12.1 describe the **purpose** of a Web Worker process 12.2 use the Web Worker APIs from JavaScript code for a Web Worker **process**.

Range
purpose (perform asynchronous processing, provide isolation for sensitive operations) **process** (create, run, and monitor

Unit 636 Implementing a Windows based data warehouse

UAN:	**T/507/0338**
Level:	3
Credit value:	10
GLH:	41
Aim:	This unit is aimed at those who will be involved in Extract Transform Load (ETL) and data warehouse development creating Business Intelligence (BI) solutions and have some responsibilities for data cleansing and data warehouse implementation. This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam for Implementing a Data Warehouse with Microsoft SQL

Learning outcome
The learner will: 1. Understand the requirements for data warehouse hardware
Assessment criteria
The learner can: 1.1 describe the main hardware considerations for building a data warehouse 1.2 explain how to use reference architectures to create a data warehouse 1.3 explain how to use data warehouse appliances to create a data warehouse.

Learning outcome
The learner will: 2. Be able to implement a data warehouse
Assessment criteria
The learner can: 2.1 describe the key elements of a data warehousing solution 2.2 describe the key considerations for a data warehousing project 2.3 implement a logical design for a data warehouse 2.4 implement a physical design for a data warehouse.

Learning outcome
The learner will: 3. Be able to create an Extract, Transform and Load (ETL) Solution
Assessment criteria
The learner can: 3.1 describe the key features of SQL Server Integration Services (SSIS) 3.2 explore source data for an ETL solution 3.3 implement a data flow using SSIS 3.4 implement control flow with **constraints** 3.5 create dynamic packages 3.6 use containers in a package control flow 3.7 enforce **consistency** 3.8 manage an **SSIS package**.

Range
constraints (tasks, precedence) **consistency** (with transactions, with checkpoints) **SSIS package** (debug, logging, error handling

Learning outcome
The learner will: 4. Be able to implement an incremental ETL process
Assessment criteria
The learner can: 4.1 describe the considerations for implementing an incremental ETL solution 4.2 extract data from source systems 4.3 insert data into a data warehouse.

Learning outcome
The learner will: 5. Be able use a cloud data warehousing solution
Assessment criteria
The learner can: 5.1 describe cloud data scenarios 5.2 describe cloud database software 5.3 implement a **cloud-based database.**

Range
cloud based database (guidance create, extract and obtain data from cloud services)

Learning outcome
The learner will: 6. Be able to use Data Quality Services (DQS)
Assessment criteria
The learner can: 6.1 describe how DQS can help manage data quality 6.2 use DQS to cleanse data 6.3 use DQS to match data.

Learning outcome
The learner will: 7. Be able to use Master Data Services
Assessment criteria
The learner can: 7.1 describe key Master Data Services concepts 7.2 implement a Master Data Services model 7.3 use the Master Data Services **add-in for spreadsheets.**

Range
add-in for spreadsheets (to view a model, to modify a model) (guidance Excel for spreadsheet)

Learning outcome
The learner will: 8. Be able to use SSIS packages
Assessment criteria
The learner can: 8.1 describe how custom components can be used to extend SSIS 8.2 describe how to use custom scripts in an SSIS package 8.3 describe SSIS deployment 8.4 plan SSIS package execution.

Learning outcome
The learner will: 9. Understand Business Intelligence (BI)
Assessment criteria
The learner can: 9.1 describe BI scenarios 9.2 explain the key features of SQL Server Reporting Services 9.3 explain the key features of SQL Server Analysis Services.

Unit 637 Managing a Windows based system

UAN:	**A/507/0342**
Level:	3
Credit value:	11
GLH:	49
Aim:	Candidates for this exam are IT professionals who configure or support Windows 8 computers, devices, users, and associated network and security resources. The networks with which these professionals typically work are configured as domain-based or peer-to-peer environments with access to the Internet and cloud services. The IT professional could be a consultant, a full-time desktop support technician, or IT generalist who administers Windows–based computers and devices as a portion of their broader technical responsibilities.

Learning outcome
The learner will: 1. Be able to implement management of a Windows based operating system
Assessment criteria
The learner can: 1.1 perform local management of Windows 1.2 perform remote management of Windows 1.3 manage Windows using Group Policy 1.4 describe management tools for Windows.

Guidance
1.2 this could be PowerShell

Learning outcome
The learner will: 2. Be able to implement an installation strategy
Assessment criteria
The learner can: 2.1 determine a Windows deployment strategy 2.2 implement a Windows migration strategy 2.3 plan Windows deployment methods 2.4 implement Windows deployment methods 2.5 plan for operating system virtualisation 2.6 create an unattended answer file 2.7 modify a Windows image offline 2.8 configure boot to Virtual Hard Drive (VHD).

Learning outcome
The learner will: 3. Be able to implement Windows authentication
Assessment criteria
The learner can: 3.1 plan user authentication 3.2 plan domain-based security 3.3 implement authentication 3.4 troubleshoot domain authentication.

Learning outcome
The learner will: 4. Be able to implement intranet connectivity
Assessment criteria
The learner can: 4.1 describe methods for obtaining IPv4 configurations 4.2 plan intranet connectivity 4.3 configure IPv4 4.4 describe how name resolution works 4.5 describe tools for troubleshooting network issues 4.6 troubleshoot common network issues.

Learning outcome
The learner will: 5. Be able to implement an application strategy for Windows
Assessment criteria
The learner can: 5.1 manage application installers 5.2 design application deployment 5.3 plan an application compatibility strategy 5.4 manage applications.

Learning outcome
The learner will: 6. Be able to implement a solution for user settings
Assessment criteria
The learner can: 6.1 plan a solution for implementation of user settings 6.2 manage user profiles 6.3 explain User Experience Virtualisation (UE-V) 6.4 deploy UE-V.

Learning outcome
The learner will: 7. Be able to configure access to cloud service
Assessment criteria
The learner can: 7.1 describe **cloud services** that support Windows management 7.2 plan for cloud services deployment 7.3 deploy cloud services 7.4 configure Windows cloud based services.

Range
cloud services (purpose, functionality, policies, updates)

Learning outcome
The learner will: 8. Be able to implement access to file and print services
Assessment criteria
The learner can: 8.1 manage local storage 8.2 implement access to files 8.3 implement access to file shares 8.4 implement file caching 8.5 plan client-side printing 8.6 configure client-side printing.

Learning outcome
The learner will: 9. Be able to implement encryption for Windows
Assessment criteria
The learner can: 9.1 plan the implementation of an Encrypting File System (EFS) 9.2 plan the use of BitLocker 9.3 implement BitLocker 9.4 manage BitLocker.

Learning outcome
The learner will: 10. Be able to implement endpoint security
Assessment criteria
The learner can: 10.1 plan endpoint security 10.2 implement centralised configuration for Windows updates 10.3 implement Windows cloud services endpoint protection 10.4 configure applications restrictions.

Learning outcome
The learner will: 11. Be able to implement extranet connectivity
Assessment criteria
The learner can: 11.1 explain how DirectAccess provides seamless remote access to intranet resources 11.2 configure Virtual Private Network (VPN) Access 11.3 manage mobile device connectivity to extranet.

Learning outcome
The learner will: 12. Be able to implement recovery solutions
Assessment criteria
The learner can: 12.1 plan a recovery solution 12.2 diagnose problems with the Windows boot process 12.3 repair Windows stability issues 12.4 implement a user data recovery strategy for Windows.

Unit 638 Designing and implementing a Windows desktop infrastructure

UAN:	**T/507/0341**
Level:	4
Credit value:	13
GLH:	56
Aim:	This unit provides the skills and knowledge necessary to as part of designing, implementing, and maintaining a Windows Server desktop infrastructure. A learner achieving this unit will have the ability to plan, configure, and implement the Windows based Server desktop services, such as desktop imaging and deployment, application/desktop virtualisation, and RDP access and infrastructure.

Learning outcome
The learner will: 1. Understand desktop deployment options
Assessment criteria
The learner can: 1.1 describe the enterprise desktop life cycle 1.2 explain how to assess readiness for a desktop deployment 1.3 describe the available methods for deploying enterprise desktops 1.4 describe volume activation technologies for enterprise desktops 1.5 plan a desktop deployment strategy 1.6 implement a volume activation solution.

Learning outcome
The learner will: 2. Understand how to plan an image management strategy
Assessment criteria
The learner can: 2.1 determine the type of **images** used in an image management strategy 2.2 determine the content of images used in an image management strategy 2.3 assess business requirements to support an image management strategy.

Learning outcome
The learner will: 3. Be able to implement desktop security
Assessment criteria
The learner can: 3.1 implement a centralised secure desktop solution by using Group Policy settings 3.2 plan device encryption by using BitLocker 3.3 implement device encryption by using BitLocker 3.4 plan a centrally managed EFS solution 3.5 implement a centrally managed EFS solution 3.6 configure desktop security.

Learning outcome
The learner will: 4. Be able to manage a desktop operating system image
Assessment criteria
The learner can: 4.1 identify the key features of the Windows *ADK* 4.2 describe the Windows *PE* environment 4.3 describe how answer files are used in Windows installations 4.4 capture a reference image 4.5 service a reference image 4.6 configure Windows DS 4.7 configure a custom windows PE environment 4.8 build a custom answer file 4.9 generalise a reference computer 4.10 configure Windows deployment services server role.

Range
4.6 for image capture and for image deployment

Learning outcome
The learner will: 5. Be able to implement user state migration
Assessment criteria
The learner can: 5.1 plan user state migration 5.2 migrate user state by using the User State Migration Tool (USMT) 5.3 create USMT XML Files 5.4 customise USMT XML Files.

Learning outcome
The learner will: 6. Be able to design an Active Directory Domain Services physical infrastructure
Assessment criteria
The learner can: 6.1 plan for the LTI environment 6.2 implement MDT for LTI 6.3 integrate Windows Deployment Services (DS) with the MDT 6.4 plan the ZTI environment 6.5 prepare the site for operating system deployment 6.6 build a reference image by using a configuration manager task sequence 6.7 deploy client images by using MDT task sequences.

Learning outcome
The learner will: 7. Be able to implement a remote desktop services infrastructure
Assessment criteria
The learner can: 7.1 plan the Remote Desktop Services environment 7.2 configure desktop deployments 7.3 extend the Remote Desktop Services environment to the Internet.

Range
7.2 for virtual machine–based and session-based

Learning outcome
The learner will: 8. Be able to manage user state virtualisation for enterprise desktops
Assessment criteria
The learner can: 8.1 describe considerations for implementing an enterprise-based updates infrastructure 8.2 describe how to use System Center Configuration Manager for software updates 8.3 describe how to manage software updates 8.4 describe how to configure Windows Intune for software updates 8.5 determine software update compliance 8.6 deploy software updates to clients.

Range
8.2 deploy, manage 8.3 for virtual machine, for images 8.4 deploy, manage

Learning outcome
The learner will: 9. Be able to design network access services.
Assessment criteria
The learner can: 9.1 design remote access services 9.2 implement remote access services 9.3 design a perimeter network.

Guidance
9.1 and 9.2 Remote Authentication Dial-In User Service (RADIUS), DirectAccess.

Learning outcome
The learner will: 10. Be able to protect enterprise desktops.
Assessment criteria
The learner can: 10.1 configure System Center Endpoint Protection 10.2 describe how to use Windows Intune endpoint protection 10.3 describe how to protect desktops by using DPM 10.4 monitor endpoint protection 10.5 configure client data protection

Guidance
10.1 to include protection point, protection policies, client settings, monitoring status

Learning outcome
The learner will: 11. Be able to monitor the performance of the desktop infrastructure
Assessment criteria
The learner can: 11.1 configure performance monitoring of desktops 11.2 configure reliability monitoring of desktops 11.3 configure operations manager for monitoring virtual environments 11.4 monitor the desktop infrastructure

Guidance
11.4 to include health, performance and VDI

Unit 639 Implementing Windows desktop application environments

UAN:	**M/507/0340**
Level:	4
Credit value:	12
GLH:	50
Aim:	This unit provides the skills and knowledge necessary to design, implement, and maintain a Windows Server desktop infrastructure. A learner achieving this unit will have the ability to plan, configure, and implement the Windows Server desktop services, such as desktop imaging and deployment, application/desktop virtualisation, and RDP access and infrastructure

Learning outcome
The learner will: 1. Be able to design an application distribution strategy.
Assessment criteria
The learner can: 1.1 describe how to develop an application life cycle strategy 1.2 describe the factors affecting application distribution design 1.3 design an application distribution strategy.

Learning outcome
The learner will: 2. Be able to resolve application compatibility.
Assessment criteria
The learner can: 2.1 explain considerations for diagnosing application compatibility issues 2.2 explain solutions available for remediating application compatibility issues 2.3 resolve application compatibility issues with the Application Compatibility Toolkit (ACT).

Learning outcome
The learner will: 3. Be able to deploy software.
Assessment criteria
The learner can: 3.1 deploy software 3.2 install Windows apps using sideloading.

Range
3.1 centrally using Group Policy, to clients

Learning outcome
The learner will: 4. Be able to configure self-service applications.
Assessment criteria
The learner can: 4.1 plan self service application deployment 4.2 configure self service application deployment 4.3 describe how to improve the self service application deployment process.

Learning outcome
The learner will: 5. Be able to implement presentation virtualisation infrastructure.
Assessment criteria
The learner can: 5.1 describe how to assess presentation virtualisation requirements 5.2 describe how to plan presentation virtualisation infrastructure 5.3 describe how to extend presentation virtualisation infrastructure 5.4 assess capacity requirements for presentation virtualisation 5.5 configure presentation virtualisation infrastructure.

Range
5.5 to include high availability, remote access)

Learning outcome
The learner will: 6. Be able to deploy presentation virtualisation applications.
Assessment criteria
The learner can: 6.1 determine a presentation virtualisation application strategy 6.2 plan how to deploy applications to Remote Desktop Session Host (RD Session Host) servers 6.3 deploy applications to RD Session Host servers 6.4 configure access to RD Session Host resources 6.5 deploy RD Session Host desktop applications 6.6 configure remote applications 6.7 verify remote applications.

Learning outcome
The learner will: 7. Be able to deploy an application virtualisation environment.
Assessment criteria
The learner can: 7.1 determine an application virtualisation model to meet business requirements 7.2 deploy components to support an application virtualisation model 7.3 deploy the Windows application virtualisation client 7.4 configure the Windows application virtualisation client.

Learning outcome
The learner will: 8. Be able to deploy virtual applications.
Assessment criteria
The learner can: 8.1 configure the Windows Application Virtualisation Sequencer 8.2 sequence applications 8.3 deploy sequenced applications deploy software updates to clients.

Learning outcome
The learner will: 9. Be able to implement application updates.
Assessment criteria
The learner can: 9.1 plan application updates 9.2 deploy application updates 9.3 implement application update security.

Learning outcome
The learner will: 10. Be able to implement application upgrades.
Assessment criteria
The learner can: 10.1 plan application upgrades 10.2 implement application upgrades 10.3 plan application concurrency 10.4 implement application concurrency 10.5 configure application version coexistence.

Guidance
10.1 upgrades would naturally include supersedence

Learning outcome
The learner will: 11. Know how to monitor application deployment.
Assessment criteria
The learner can: 11.1 describe how to plan application monitoring 11.2 describe how to plan **software monitoring** 11.3 describe how to monitor application resource use 11.4 configure server monitoring.

Guidance
11.2 **software monitoring** (inventory and metering)

Unit 640 Supporting Microsoft exchange server solutions

UAN:	**J/507/0344**
Level:	4
Credit value:	12
GLH:	52
Aim:	This unit is designed to provide learners with the knowledge and skills to plan, deploy, manage, secure, and support Microsoft Exchange Server. It covers monitoring, maintaining, and troubleshooting an Exchange Server that will include guidelines, best practices, and considerations to help optimize performance and minimize errors and security threats. This is an ideal for those aspiring to be enterprise-level messaging administrators, though it would also benefit those seeking a career as an IT generalist and or help desk professional. This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam for the Core Solutions of Microsoft Exchange Server.

Learning outcome
The learner will: 1. Be able to manage Microsoft Exchange Server
Assessment criteria
The learner can: 1.1 describe Exchange Server prerequisites 1.2 deploy an Exchange Server 1.3 manage Exchange Server 1.4 evaluate requirements for an Exchange Server installation 1.5 monitor Exchange Server 1.6 maintain Exchange Server 1.7 troubleshoot Exchange Server.

Learning outcome
The learner will: 2. Be able to configure Mailbox Servers
Assessment criteria
The learner can: 2.1 describe the Mailbox Server role 2.2 plan for a Mailbox Server role deployment 2.3 configure the Mailbox Server 2.4 configure Storage on the Mailbox Server 2.5 configure Mailbox Databases.

Learning outcome
The learner will: 3. Be able to manage recipient objects
Assessment criteria
The learner can: 3.1 manage Exchange Server mailboxes 3.2 manage Exchange Server recipients 3.3 implement public folders 3.4 configure address lists 3.5 configure policies.

Learning outcome
The learner will: 4. Be able to configure self-service applications
Assessment criteria
The learner can: 4.1 plan self-service application deployment 4.2 configure self-service application deployment 4.3 describe how to improve the self-service application deployment process.

Learning outcome
The learner will: 5. Be able to configure messaging client connectivity
Assessment criteria
The learner can: 5.1 describe the Exchange Server client services 5.2 configure messaging client web Application 5.3 plan mobile messaging 5.4 configure mobile messaging 5.5 configure secure Internet access for Client Access server.

Learning outcome
The learner will: 6. Be able to configure high availability
Assessment criteria
The learner can: 6.1 describe a highly available Exchange Server 6.2 configure highly available Mailbox Databases 6.3 configure highly available Client Access servers.

Learning outcome
The learner will: 7. Be able to implement disaster recovery
Assessment criteria
The learner can: 7.1 plan disaster mitigation 7.2 plan Exchange Server backup 7.3 implement Exchange Server backup 7.4 plan Exchange Server recovery 7.5 implement Exchange Server recovery.

Learning outcome
The learner will: 8. Be able to deploy virtual applications
Assessment criteria
The learner can: 8.1 describe how message transport operates in Exchange Server 8.2 plan message transport 8.3 configure message transport 8.4 manage transport rules.

Learning outcome
The learner will: 9. Be able to implement message security
Assessment criteria
The learner can: 9.1 plan messaging security 9.2 implement an antivirus solution for Exchange Server 9.3 implement an anti-spam solution for Exchange Server.

Learning outcome
The learner will: 10. Be able to configure administrative security
Assessment criteria
The learner can: 10.1 configure Role Based Access Control (RBAC) permissions 10.2 configure audit logging.

Unit 641 Designing and implementing a Windows server infrastructure

UAN:	**M/507/0337**
Level:	4
Credit value:	13
GLH:	54
Aim:	This unit provides the skills and knowledge necessary design, implement, and maintain a Windows based Server infrastructure. A learner achieving this unit will have the ability to plan, configure, and implement Windows based Server services, such as server deployment, server virtualisation, and network access and infrastructure. This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam for Designing and Implementing a Server Infrastructure

Learning outcome
The learner will: 1. Understand how to plan a server upgrade or migration
Assessment criteria
The learner can: 1.1 describe server upgrade considerations 1.2 describe server migration considerations 1.3 explain how to plan for server virtualisation 1.4 plan a server upgrade and migration strategy.

Learning outcome
The learner will: 2. Be able to implement a server deployment strategy
Assessment criteria
The learner can: 2.1 explain how to plan for an automated server installation and deployment strategy 2.2 determine a deployment automation strategy 2.3 implement an automated deployment strategy.

Learning outcome
The learner will: 3. Be able to implement an address management solution
Assessment criteria
The learner can: 3.1 design a Dynamic Host Configuration Protocol (DHCP) strategy 3.2 implement DHCP strategy.

Guidance
3.1 and 3.2 to include DNCP scope configuration, IP address management (IPAM))

Learning outcome
The learner will: 4. Be able to implement a name resolution strategy
Assessment criteria
The learner can: 4.1 design a Domain Name System (DNS) server implementation strategy 4.2 implement a DNS zone strategy 4.3 configure DNS zone replication 4.4 optimise the DNS server configuration.

Guidance
4.1 to include DNS namespace, DNS zone strategy, DNS zone replication, DNS for high availability and security

Learning outcome
The learner will: 5. Be able to implement Active Directory Domain Services logical infrastructures
Assessment criteria
The learner can: 5.1 design an Active Directory Domain Services (AD DS) infrastructure 5.2 implement an Active Directory Domain Services (AD DS) infrastructure 5.3 plan an AD DS administrative tasks delegation model 5.4 design an Organizational Unit (OU) structure 5.5 design an AD DS group strategy 5.6 implement an AD DS group strategy 5.7 determine information required to facilitate a Group Policy Object (GPO) design 5.8 analyse the information required to facilitate a GPO design 5.9 create a GPO design 5.10 implement a GPO design.

Guidance
5.1 and 5.2 to include forest, forest trusts, domains, domain trusts, namespaces

Learning outcome
The learner will: 6. Be able to design an Active Directory Domain Services physical infrastructure
Assessment criteria
The learner can: 6.1 design AD DS sites 6.2 design AD DS replication 6.3 design domain controller placement 6.4 design domain controller deployments 6.5 implement active directory sites 6.6 implement domain controllers.

Guidance
6.4 to include highly available and on virtual machines

Learning outcome
The learner will: 7. Be able to implement storage
Assessment criteria
The learner can: 7.1 plan a **storage solution** 7.2 implement a storage solution 7.3 configure redundant storage space.

Range
storage solution (storage spaces, efficient storage, Internet Small Computer System Interface (iSCSI) storage area network (SAN))

Learning outcome
The learner will: 8. Be able to implement file services
Assessment criteria
The learner can: 8.1 plan a Distributed File System (DFS) 8.2 implement a DFS 8.3 plan Windows BranchCache 8.4 implement Windows BranchCache 8.5 plan Dynamic Access Control 8.6 implement Dynamic Access Control.

Learning outcome
The learner will: 9. Be able to design network access services
Assessment criteria
The learner can: 9.1 design **remote access services** 9.2 implement remote access services 9.3 design a perimeter network.

Range
remote access services (Remote Authentication Dial-In User Service (RADIUS), DirectAccess

Learning outcome
The learner will: 10. Be able to design network protection
Assessment criteria
The learner can: 10.1 design **network security** 10.2 implement network security 10.3 identify network security threats 10.4 describe how to mitigate network security threats.

Range
network security (Windows Firewall, Network Access Protection (NAP))

Unit 642 Creating an event-driven computer program

UAN:	**F/601/3179**
Level:	3
Credit value:	12
GLH:	90
Aim:	This unit covers more advanced concepts of event-driven computer languages and their use to implement, refine and test computer programs.

Learning outcome
The learner will: 1. Implement a software design using event driven programming
Assessment criteria
The learner can: 1.1 Identify the screen components and data and file structures required to implement a given design 1.2 Select, declare and initialise variable and data structure types and sizes to implement design requirements 1.3 Select and assign properties to screen components to implement design requirements 1.4 Select and associate events (including parameter passing) to 1.5 screen components to implement design requirements 1.6 Select and declare file structures to meet design file storage requirements 1.7 Select and use standard input/output commands to implement design requirements 1.8 Make effective use of operators and predefined functions 1.9 Make effective use of an integrated development environment (IDE) 1.10 including code and screen templates.

Learning outcome
The learner will: 2. Refine an event-driven program to improve quality
Assessment criteria
The learner can: 2.1 Use an agreed standard for naming, comments and code layout determine a deployment automation strategy 2.2 Define user functions to replace repeating code sequences 2.3 Implement data validation for inputs 2.4 Identify and implement opportunities for error handling and reporting.

Learning outcome
The learner will: 3. Test the operation of an event-driven program
Assessment criteria
The learner can: 3.1 Make effective use of the debugging facilities available in the IDE 3.2 Prepare a test strategy 3.3 Select suitable test data and determine expected test results 3.4 Record actual test results to enable comparison with expected results 3.5 Analyse actual test results against expected results to identify discrepancies 3.6 Investigate test discrepancies to identify and rectify their causes.

Learning outcome
The learner will: 4. Document an event-driven program
Assessment criteria
The learner can: 4.1 Create on-screen help to assist the users of a computer program implement a DNS zone strategy 4.2 Create documentation for the support and maintenance of a computer programme.

Unit 643 Creating a procedural computer program

UAN:	**R/601/3171**
Level:	3
Credit value:	12
GLH:	90
Aim:	This unit covers more advanced concepts of procedural computer languages and their use to implement, refine and test computer programs.

Learning outcome
The learner will: 1. Implement a software design using procedural programming
Assessment criteria
The learner can: 1.1 Identify the programme modules and data and file structures required to implement a given design 1.2 Select, declare and initialise variable and data structure types and sizes to implement design requirements 1.3 Select and implement control structures to meet the design algorithms 1.4 Select and declare file structures to meet design file storage requirements 1.5 Select and use standard input/output commands to implement design requirements 1.6 Make effective use of operators and predefined functions 1.7 Correctly use parameter passing mechanisms.

Learning outcome
The learner will: 2. Refine a procedural program to improve quality
Assessment criteria
The learner can: 2.1 Use an agreed standard for naming, comments and code layout define user functions to replace repeating code sequences 2.2 Define user functions to replace repeating code sequences 2.3 Implement data validation for inputs 2.4 Identify and implement opportunities for error handling and reporting.

Learning outcome
The learner will: 3. Test the operation of a procedural program
Assessment criteria
The learner can: 3.1 Make effective use of available debugging tools 3.2 Prepare a test strategy 3.3 Select suitable test data and determine expected test results 3.4 Record actual test results to enable comparison with expected results 3.5 Analyse actual test results against expected results to identify discrepancies 3.6 Investigate test discrepancies to identify and rectify their causes.

Learning outcome
The learner will: 4. Document a computer programme
Assessment criteria
The learner can: 4.1 Create documentation to assist the users of a computer programme 4.2 Create documentation for the support and maintenance of a computer programme.

Unit 644 Creating an object-oriented computer program

UAN:	**L/601/3184**
Level:	3
Credit value:	12
GLH:	90
Aim:	This unit covers more advanced concepts of object-oriented computer languages and their use to implement, refine and test computer programs.

Learning outcome
The learner will: 1. Implement a software design using object-oriented programming
Assessment criteria
The learner can: 1.1 Identify the objects and data and file structures required to implement a given design 1.2 Select, declare and initialise variable and data structure types and sizes to implement design requirements 1.3 Define relationships between objects to implement design requirements 1.4 Implement message passing between objects to implement design requirements 1.5 Implement object behaviours using control structures to meet the design algorithms 1.6 Select and declare file structures to meet design file storage requirements 1.7 Select and use standard input/output commands to implement design requirements 1.8 Make effective use of operators and predefined functions 1.9 Make effective use of an Integrated Development Environment (IDE) including code and screen templates.

Learning outcome
The learner will: 2. Refine an object-oriented program to improve quality
Assessment criteria
The learner can: 2.1 Use an agreed standard for naming, comments and code layout 2.2 Make effective use of encapsulation, polymorphism and inheritance 2.3 Implement data validation for inputs 2.4 Identify and implement opportunities for error handling and reporting.

Learning outcome
The learner will: 3. Test the operation of an object-oriented driven program
Assessment criteria
The learner can: 3.1 Make effective use of the debugging facilities available in the IDE 3.2 Prepare a test strategy 3.3 Select suitable test data and determine expected test results 3.4 Record actual test results to enable comparison with expected results 3.5 Analyse actual test results against expected results to identify discrepancies 3.6 Investigate test discrepancies to identify and rectify their causes.

Learning outcome
The learner will: 4. Document an object-oriented driven program
Assessment criteria
The learner can: 4.1 Create on-screen help to assist the users of a computer program 4.2 Create documentation for the support and maintenance of a computer program.

Unit 645 Introduction to networks

UAN:	**H/507/0173**
Level:	3
Credit value:	17
GLH:	83
Aim:	This unit introduces learners to the architecture, structure, functions, components, and models of the Internet and other computer networks. It covers the principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations. Successful completion of the unit would enable learners to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes. This unit includes content from Cisco CCNA Routing and Switching curriculum. In particular, the content is relevant to the Introduction to Networks course.

Learning outcome
The learner will: 1. Understand networking within business
Assessment criteria
The learner can: 1.1 explain how multiple networks are used in everyday life 1.2 explain how rules are used to facilitate communication 1.3 explain trends in networking that will affect the use of networks 1.4 describe how a host computer builds a message and sends it to a destination.

Learning outcome
The learner will: 2. Understand how standardisation supports interoperable end-to-end communications
Assessment criteria
The learner can: 2.1 explain the topologies used in a network 2.2 explain the devices used in a network 2.3 explain the characteristics of a network that supports communications 2.4 explain the role of protocols in facilitating interoperability in network communications 2.5 explain the role of standards organisations in facilitating interoperability in network communications.

Learning outcome
The learner will: 3. Understand the process by which devices access resources using the TCP/IP suite
Assessment criteria
The learner can: 3.1 explain how devices on a Local Area Network (LAN) access resources 3.2 explain how the **physical layer** supports communication across data networks (protocols and services) 3.3 explain the role of the **data link layer** in supporting communication across data networks (protocols and services) 3.4 compare media access control techniques with logical topologies used in networks 3.5 explain the role of the Address Resolution Protocol (ARP) in supporting network connectivity 3.6 explain the operation of Ethernet at the network access layer of TCP/IP within a LAN 3.7 explain how the **network layer** supports communication across data networks 3.8 explain how the **transport layer** supports communication across data networks 3.9 compare the operations of transport layer protocols in supporting end-to-end communication 3.10 explain the operation of the application layer in providing support to end-user applications 3.11 describe the features of the **application layer** 3.12 describe the operation of the application layer 3.13 describe the use of the application layer.

Range
network layer (protocols and services) **transport layer** (protocols and services) **application layer** (protocols and services)

Learning outcome
The learner will: 4. Be able to design an IP addressing scheme to provide network connectivity
Assessment criteria
The learner can: 4.1 explain the use of IPv4 addresses to provide connectivity 4.2 calculate **IPv4 addresses** to enable end-to-end connectivity 4.3 design an IP addressing scheme to provide connectivity to end users 4.4 explain the use of IPv6 addresses to provide connectivity 4.5 explain design considerations for implementing IPv6.

Range
IPv4 addresses (network, host, broadcast)

Learning outcome
The learner will: 5. Be able to implement network connectivity between devices
Assessment criteria
The learner can: 5.1 connect network devices with media 5.2 configure IP address parameters on devices to provide end-to-end connectivity 5.3 explain how a network of directly connected segments is configured 5.4 explain how a network of directly connected segments is verified 5.5 configure wireless on an integrated router 5.6 use testing utilities to test network connectivity.

Learning outcome
The learner will: 6. Be able to configure network access
Assessment criteria
The learner can: 6.1 determine the devices required to route traffic 6.2 explain how routers enable end-to-end connectivity 6.3 configure a router 6.4 explain how switches in enable end-to-end connectivity 6.5 implement LAN switching to enable end-to-end connectivity 6.6 use show commands to establish a relative performance baseline for the network.

Learning outcome
The learner will: 7. Be able to configure initial Inter Network Operating System (IOS) device settings
Assessment criteria
The learner can: 7.1 explain features of IOS software 7.2 explain functions of IOS software 7.3 configure initial setting on a network using IOS software 7.4 configure connectivity devices with device hardening features to enhance security 7.5 manage IOS configuration files to ensure device operation.

Unit 646 Routing and switching essentials

UAN:	**K/507/0174**
Level:	4
Credit value:	27
GLH:	143
Aim:	This course provides for learners an understanding of the architecture, components, and operations of routers and switches in a small network. It develops skills related to configuring a router and a switch for basic functionality. On successful completion of this unit, learners will be able to configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPng, single-area and multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 This unit includes content from Cisco CCNA Routing and Switching curriculum. In particular, the content is relevant to the Routing and Switching Essentials course.

Learning outcome
The learner will: 1. Be able to configure switch ports to manage network access
Assessment criteria
The learner can: 1.1 explain how Layer 2 switches forward data in a Local Area Network (LAN) 1.2 explain how switched networks support business 1.3 configure switch configurations 1.4 configure a switch using security best practices.

Learning outcome
The learner will: 2. Be able to implement Virtual Local Area Networks (VLANs) to logically segment networks
Assessment criteria
The learner can: 2.1 analyse how VLANs segment broadcast domains 2.2 implement VLANs to segment a network 2.3 configure routing between VLANs 2.4 configure VLAN 2.5 configure trunking security features 2.6 implement inter-VLAN routing using Layer 3 switching to forward data 2.7 troubleshoot issues in a switched, multi-VLAN routed environment.

Learning outcome
The learner will: 3. Be able to configure routing technologies to facilitate internetwork communications
Assessment criteria
The learner can: 3.1 explain how routers use information in data packets to make forwarding decisions 3.2 explain the function of dynamic routing protocols 3.3 configure a router for multiple directly connected networks 3.4 configure the RIP and RIPng routing protocol 3.5 compare how routers learn about remote networks 3.6 analyse a **routing table** to determine information.

Range
routing table (route source, administrative distance, metric)

Learning outcome
The learner will: 4. Be able to implement static routing to enable end-to-end connectivity
Assessment criteria
The learner can: 4.1 explain the ways in which static routes can be implemented 4.2 configure static routes to enable connectivity 4.3 troubleshoot **route configurations**.

Range
route configurations (static, default)

Learning outcome
The learner will: 5. Be able to implement Open Shortest Path First (OSPF) to enable end-to-end connectivity
Assessment criteria
The learner can: 5.1 explain the operation of a single-area OSPF as a link-sate routing protocol that enables dynamic routing 5.2 explain the function of link-state controls 5.3 configure OSPFv2 to enable internetwork communications in a IPv4 network 5.4 configure OSPFv3 to enable internetwork communications in an IPv6 network.

Learning outcome
The learner will: 6. Be able to automate IP addressing configuration for end devices
Assessment criteria
The learner can: 6.1 design an IP addressing scheme to provide connectivity to end users 6.2 implement DHCPv4 to provide addressing services to end-devices across multiple LANs 6.3 implement DHCPv6 to provide IP addressing services to end-devices across multiple LANs.

Learning outcome
The learner will: 7. Be able to implement Access Control Lists (ACL) to filter traffic
Assessment criteria
The learner can: 7.1 explain the purpose of ACLs 7.2 explain the operation of ACLs 7.3 implement IPV4 **ACLs** to filter traffic 7.4 implement IPV6 ACLs to filter traffic 7.5 troubleshoot ACL implementation issues affecting end-to-end connectivity.

Range
ACLs (standard, extended)

Learning outcome
The learner will: 8. Be able to implement Network Address Translation (NAT) for IP address conservation.
Assessment criteria
The learner can: 8.1 explain NAT services in providing IPv4 address scalability 8.2 configure NAT services on the edge router to provide IPv4 address scalability 8.3 interpret device output to correct NAT implementation issues affecting end-to-end connectivity from an internal to external LAN.

Unit 647 Scaling networks

UAN:	**M/507/0175**
Level:	3
Credit value:	15
GLH:	73
Aim:	This unit develops an understanding of the architecture, components, and operations of routers and switches in large, complex networks. Learners develop understanding and skills required to configure routers and switches for advanced functionality. Successful completion of the unit would enable learners to configure and troubleshoot routers and switches and resolve common issues with OSPF, EIGRP, and STP in both IPv4 and IPv6 networks. They will also develop the knowledge and skills needed to implement a WLAN in a small-to-medium network. This unit includes content from Cisco CCNA Routing and Switching curriculum. In particular, the content is relevant to the Scaling Networks course.

Learning outcome
The learner will: 1. Be able to configure switching hardware that facilitates network access.
Assessment criteria
The learner can: 1.1 explain the need for hierarchical network design that is scalable 1.2 select network devices to meet requirements (feature compatibility, network) 1.3 explain the purpose of the spanning tree protocol in a switched Local Area Network (LAN) environment with redundant inter-switch links 1.4 explain the operation of Per Virtual LAN Spanning Tree (PVST+) in a switched LAN environment 1.5 configure PVST+ in a switched LAN 1.6 configure Rapid PVST+ in a switched LAN 1.7 explain the operation of link aggregation in a switched LAN environment 1.8 implement link aggregation to improve performance on high-traffic switch links 1.9 verify First Hop Redundancy Protocols (FHRP) in a switched

network.

Learning outcome
The learner will: 2. Be able to implement wireless Local Area Networks (LANs) to provide network access.
Assessment criteria
The learner can: 2.1 explain how standards ensure interoperability in wireless networks 2.2 explain how wireless LAN components are deployed 2.3 describe security features available in a wireless network 2.4 implement a wireless LAN using a wireless router.

Learning outcome
The learner will: 3. Be able to implement Open Shortest Path First (OSPF) to enable end-to-end connectivity.
Assessment criteria
The learner can: 3.1 explain the operation of multi-area OSPF 3.2 implement multi-area OSPF for IPV4 to enable internetwork communications 3.3 implement advanced OSPF features to enhance operation 3.4 troubleshoot singe-area OSPF configuration issues.

Learning outcome
The learner will: 4. Be able to implement Enhanced Interior Gateway Routing Protocol (EIGRP).
Assessment criteria
The learner can: 4.1 explain how the characteristics of EIGRP enable dynamic routing 4.2 explain the operation of EIGRP that enables end-to-end communication 4.3 implement EIGRP for IPv4 to enable internetwork communication 4.4 implement EIGRP for IPv6 to enable internetwork communications 4.5 implement advanced EIGRP features to enhance operations 4.6 troubleshoot EIGRP configuration issues.

Learning outcome
The learner will: 5. Be able to manage Inter Network Operating System (IOS) system image files.
Assessment criteria
The learner can: 5.1 select IOS system image files to support network requirements 5.2 configure a device to activate an upgrade IOS image.

Unit 648 Connecting networks

UAN:	**T/507/0176**
Level:	3
Credit value:	18
GLH:	91
Aim:	This unit covers the WAN technologies and network services required by converged applications in a complex network. It enables learners to understand the selection criteria of network devices and WAN technologies to meet network requirements. They will learn how to configure and troubleshoot network devices and resolve common issues with data link protocols. They will also develop the knowledge and skills needed to implement Virtual Private Network (VPN) operations in a complex network. This unit includes content from Cisco CCNA Enterprise Networking, Security, and Automation curriculum. In particular, the content is relevant to the Connecting Networks course.

Learning outcome
The learner will: 1. Understand hierarchical network design.
Assessment criteria
The learner can: 1.1 explain how a hierarchical network model is used to design networks 1.2 explain how a modular approach is used in network design 1.3 explain how business network architectures work in collaboration with enterprise architecture to allow organisations to support business.

Learning outcome
The learner will: 2. Understand Wide Area Network (WAN) access technologies for small to medium-sized networks.
Assessment criteria
The learner can: 2.1 describe WAN access technologies 2.2 select WAN access technologies to satisfy business requirements.

Learning outcome
The learner will: 3. Be able to configure a serial interface to enable WAN communication.
Assessment criteria
The learner can: 3.1 explain the operation of Point-to-Point Protocol (PPP) across a point-to-point serial link 3.2 configure PPP to enable internetwork communications 3.3 troubleshoot PPP issues that affect internetwork communications 3.4 configure High Level Data Link Control (HLDC) encapsulations on a point-to-point serial communication link to enable WAN connectivity 3.5 explain the benefits of Frame Relay 3.6 explain the operation of Frame Relay 3.7 configure Frame Relay issues that affect internetwork communications

Learning outcome
The learner will: 4. Be able to configure an Ethernet interface to enable broadband communication.
Assessment criteria
The learner can: 4.1 explain how broadband technologies support remove connectivity for business 4.2 select broadband solutions to support remote connectivity 4.3 configure a router Ethernet interface for connectivity.

Learning outcome
The learner will: 5. Be able to implement Network Address Translation (NAT) for IP conservation.
Assessment criteria
The learner can: 5.1 explain the operation of NAT services in providing IPv4 address scalability 5.2 configure NAT services on the edge router to provide IPv4 address scalability 5.3 troubleshoot NAT issues that affect internetwork communications.

Learning outcome
The learner will: 6. Be able to configure a tunnelling protocol to enable site-to-site communication.
Assessment criteria
The learner can: 6.1 explain the use of Virtual Private Networks (VPN) in securing site-to-site connectivity 6.2 configure a Generic Routing Encapsulation (GRE) to set the foundation for secure site-to-site connectivity 6.3 explain the operation of IPsec to secure VPN traffic 6.4 explain how **remote access technologies** are used to support remote connectivity.

Range
remote access technologies (Secure Socket Layer (SSL), IPsec)

Learning outcome
The learner will: 7. Be able to configure network monitoring.
Assessment criteria
The learner can: 7.1 configure Syslog to monitor network operations 7.2 configure Simple Network Management Protocol (SNMP) to monitor network operations.

Learning outcome
The learner will: 8. Be able to troubleshoot data networks.
Assessment criteria
The learner can: 8.1 determine troubleshooting approach required for network problems 8.2 troubleshoot end-to-end connectivity.

Unit 650 Computer games development

UAN:	**F/601/3165**
Level:	3
Credit value:	10
GLH:	71
Aim:	The aim of this unit is to teach computer game development; in order to do this the learner will explore the various architecture and hardware components. The learner will explore developments within the computer games industry that are required in the development of computer games. They will also evaluate existing games and will also look at the different features of a range of computer games. The learner will propose a plan for developing a sample game and then move into planning and developing and resting elements of that game.

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

Learning outcome
The learner will: 2. Understand the computer games industry.
Assessment criteria
The learner can: 2.1 describe the stages of evolution of computer game industry 2.2 describe the roles and activities required to develop modern 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 a structured 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 produce a pre-production proposal document for a computer game project 4.2 identify the components required to develop a computer game 4.3 produce an implementation plan for a computer game development

Learning outcome
The learner will: 5. Be able to implement elements 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 651 Data modelling

UAN:	**L/601/3203**
Level:	3
Credit value:	9
GLH:	75
Aim:	The aim of this unit is to teach the concepts of data modelling. The learner will be taught about the basic concepts; including entities, attributes and relationships, and will also learn the objectives of normalisation to 3rd normal form as well as putting this into practice. The learner will use what they have learnt to produce logical data model.

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 purpose of keys 1.5 Describe an application where un-normalized 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. Be able to use data modelling techniques to create logical data models.
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. Be able to use data modelling techniques to 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 describe the logical data model of a normalised data set

Unit 653 Investigating and defining customer requirements for ICT systems

UAN:	**R/601/3249**
Level:	3
Credit value:	12
GLH:	75
Aim:	The aim of this unit is to teach the learner, how to investigate the needs of users by looking into their existing systems and will explore all of the techniques needed to do this effectively. The learner will then learn how to analyse this information, as well as learning the techniques needed to record the results on standard documentation.

Learning outcome
The learner will: 1. Investigate existing systems and processes
Assessment criteria
The learner can: 1.1 Use three of the following investigative methods: • observations • examination of existing documents, records or software • questionnaires • site surveys 1.2 Record the results of investigations using standard documentation 1.3 Explain the importance of preserving the confidentiality of customer information.

Learning outcome
The learner will: 2. Analyse information to identify needs and constraints
Assessment criteria
The learner can: 2.1 Describe the type of defect, including inaccuracy, duplication and omission, which can arise in information 2.2 Describe the types of customer needs and constraints which can

affect the design of an ICT system

2.3 Analyse information to identify customer needs for:

- data to be stored and processed
- functionality in terms of inputs, processes and outputs
- capacity including numbers of users, throughput, and data storage

2.4 Analyse information to identify customer constraints

2.5 Record the results of analyses using standard documentation.

Learning outcome
The learner will: 3. Be able to manage Linux based Administrative Tasks
Assessment criteria
The learner can: 3.1 Manage user and group accounts and related system files 3.2 Automate system administration tasks by scheduling jobs 3.3 Understand the processes to localise systems and settings.

Learning outcome
The learner will: 4. Be able to manage Linux Essential System Services
Assessment criteria
The learner can: 4.1 Maintain system time 4.2 Manage System Logging 4.3 Understand Mail Transfer Agent (MTA) basics 4.4 Manage Printers and Printing.

Learning outcome
The learner will: 5. Understand networking fundamentals
Assessment criteria
The learner can: 5.1 Understand the fundamentals of internet Protocols 5.2 Manage basic network troubleshooting 5.3 Configure client side Domain Name Services (DNS).

Learning outcome
The learner will: 6. Be able to manage Linux based security
Assessment criteria
The learner can: 6.1 Perform security administration tasks 6.2 Configure host security 6.3 Secure data with encryption.

Unit 857 Principles of information governance and assurance

UAN:	**K/505/5786**
Level:	3
Credit value:	15
GLH:	75
Aim:	This unit develops the knowledge and skills required to implement information governance. Upon completion of this unit, learners will have an understanding of the procedures involved in implementing information governance and the legislation that must be complied with.

Learning outcome
The learner will: 1. Understand the purpose of information governance
Assessment criteria
The learner can: 1.1 explain the importance of confidentiality, integrity and availability for information systems 1.2 explain the role of identity in information security 1.3 explain the importance and use of cryptographic techniques in information security 1.4 describe the information security procedures required by different types of organisations 1.5 outline the legal requirements for information security for individuals and organisations

Learning outcome
The learner will: 2. Understand information security threats and vulnerabilities
Assessment criteria
The learner can: 2.1 describe the types of threats facing the information security of individuals and organisations 2.2 explain the development of threats to the information security of individuals and organisations 2.3 describe sources of threats to information security in terms of opportunity, ability and motive 2.4 describe the types of information security vulnerabilities that can

	arise in hardware and software components
2.5	explain how hardware and software vulnerabilities can be identified and resolved

Learning outcome
The learner will: 3. Understand information security techniques and technologies
Assessment criteria
The learner can: 3.1 describe common cryptographic techniques including examples of their use in information security 3.2 explain the limitations of cryptography and their impact on information security 3.3 explain how physical and logical access controls can be used to protect information systems 3.4 design an access control system incorporating levels of access and the use of identity to protect a given information asset 3.5 compare proactive and reactive information security techniques 3.6 explain the information security features of hardware and network components 3.7 compare ethical and unethical hacking 3.8 describe how ethical hacking can contribute to information security testing

Learning outcome
The learner will: 4. Understand information security risk assessment and management
Assessment criteria
The learner can: 4.1 describe how to identify information assets which may be at risk 4.2 assess the probability and impact of given risks 4.3 describe available methods for preserving and restoring the integrity and availability of information assets 4.4 explain the responsibilities of system users for information security.

Unit 858 Testing the security of information systems

UAN:	**T/505/5788**
Level:	3
Credit value:	12
GLH:	40
Aim:	This unit aims to develop the knowledge and skills required to test the information security implemented on a system to establish its effectiveness. Upon completion of this unit, learners will be able to plan and carry out the security testing of information systems.

Learning outcome
The learner will: 1. Be able to conduct security testing
Assessment criteria
The learner can: 1.1 develop test scripts for specified information assurance requirements testing 1.2 create plans that ensure that specified information assurance requirements are tested 1.3 implement specified preparations prior to carrying out tests 1.4 apply specified test methods, tools and techniques following organisational procedures 1.5 record the results of tests using standard documentation 1.6 implement specified activities following the completion of testing

Learning outcome
The learner will: 2. Be able to report on test results
Assessment criteria
The learner can: 2.1 examine the results of testing to identify security vulnerabilities 2.2 prioritise identified vulnerabilities against specified information assurance requirements 2.3 report any high priority vulnerabilities to the relevant persons following organisational procedures 2.4 identify the type of actions required to mitigate identified

	vulnerabilities
2.5	report the results of test activities using standard documentation following organisational procedures

Unit 859 Carrying out information security risk assessment

UAN:	**T/505/5791**
Level:	3
Credit value:	9
GLH:	30
Aim:	This unit develops the knowledge and skills required to assess information security risks. Learners achieving this unit will be able to gather information that can be used to develop information security risk contingency plans and manage the identified risks.

Learning outcome
The learner will: 1. Be able to gather information on information security risks
Assessment criteria
The learner can: 1.1 verify the scope of information assets and system components to be assessed with relevant persons 1.2 use specified investigative methods following organisational procedures 1.3 gather information to enable the security of specified information assets and system components to be assessed 1.4 record all gathered information using standard documentation

Learning outcome
The learner will: 2. Be able to assess and report on information security risks
Assessment criteria
The learner can: 2.1 examine gathered information to identify risks to the security of specified information assets and system components 2.2 categorise the priority of identified risks by determining their probability of occurrence and potential impact 2.3 report high priority risks to the relevant persons following organisational procedures 2.4 determine the types of actions required to mitigate identified risks 2.5 report the results of risk assessment activities using standard documentation following organisational procedures

Unit 860 Investigating information security incidents

UAN:	**F/505/5793**
Level:	3
Credit value:	9
GLH:	23
Aim:	This unit aims to develop the knowledge and skills required to investigate a security incident. Upon completion of this unit, learners will be able to gather information that can be used to determine the impact of a security incident and make recommendations regarding the mitigation of the associated risks.

Learning outcome
The learner will: 1. Be able to gather information to investigate information security incidents
Assessment criteria
The learner can: 1.1 identify the information assets and system components that may be impacted by detected incidents 1.2 verify the scope of detected incidents with relevant persons 1.3 obtain and preserve evidence relating to detected incidents

Learning outcome
The learner will: 2. Be able to investigate information security incidents
Assessment criteria
The learner can: 2.1 undertake agreed investigative actions 2.2 examine how access to the affected information assets and system components was obtained 2.3 report to the relevant persons any incidents for which the mode of access cannot be identified 2.4 make recommendations on the need for detailed forensic examinations 2.5 report on incident investigation activities using standard documentation 2.6 follow organisational procedures for investigation activities

Unit 862 Carrying out information security incident management activities

UAN:	**F/505/5812**
Level:	3
Credit value:	9
GLH:	25
Aim:	This unit aims to develop the knowledge and skills required to manage information security risks., Learners will be able to gather information that can be used to develop information security risk contingency plans and manage the identified risks.

Learning outcome
The learner will: 1. Be able to gather information to manage information security incidents
Assessment criteria
The learner can: 1.1 follow organisational procedures for the detection and classification of incidents 1.2 identify the information assets and system components that may be impacted by detected incidents 1.3 verify the scope of detected incidents with relevant persons 1.4 obtain information and data on incidents to assess their impact on information assets and system components

Learning outcome
The learner will: 2. Be able to carry out information security incident management activities
Assessment criteria
The learner can: 2.1 identify types of actions required to resolve incidents or mitigate their impact 2.2 report any incidents which cannot be resolved or mitigated to the relevant persons following organisational procedures

2.3	make recommendations for specific actions to be taken to respond to incidents
2.4	report on incident management activities using standard documentation following organisational procedures
2.5	follow organisational procedures for the closure of incidents

Unit 863 Carrying out information security forensic examinations

UAN:	**R/505/5801**
Level:	3
Credit value:	6
GLH:	10
Aim:	This unit develops in learners the knowledge and skills required to undertake forensic examinations following an issue involving information, to ensure that evidence is preserved. Learners achieving this unit will know how to carry out the actions required to prevent evidence being compromised by activities undertaken when investigating an issue involving information security.

Learning outcome
The learner will: 1. Be able to carry out information security forensic examinations
Assessment criteria
The learner can: 1.1 follow organisational procedures for forensic examinations 1.2 undertake specified actions to secure information assets and system components subject to actual or attempted breaches of security 1.3 apply forensic methods to examine specified system information for evidence of actual or attempted breaches of security policy or legislation 1.4 report any identified sources of actual or attempted breaches of security to the relevant persons 1.5 use specified tools to analyse the integrity of software 1.6 report on forensic examination activities using standard documentation

Unit 865 Carrying out Information Security audits

UAN:	**A/505/5808**
Level:	3
Credit value:	6
GLH:	10
Aim:	This unit provides the skills and knowledge necessary to plan and undertake information security audits. Upon completion of this unit, learners will be able to plan and undertake security audits that can be used to manage any identified risks.

Learning outcome
The learner will: 1. Be able to carry out information security audit activities
Assessment criteria
The learner can: 1.1 verify the scope of information assets and system components to be audited with relevant persons 1.2 use specified audit methods to obtain information and data relating to information assets and system components to assess security compliance 1.3 examine information and data relating to information assets and system components to assess security compliance 1.4 report any security non-compliance to the relevant persons 1.5 report on audit activities using standard documentation 1.6 follow organisational procedures for information security audits

Unit 866 System operation

UAN:	**A/500/7340**
Level:	3
Credit value:	12
GLH:	100
Aim:	

Learning outcome
The learner will: 1. Know how to operate the system
Assessment criteria
The learner can: 1.1 explain the operating procedures that are applicable to the system, such as: a. required service levels (e.g. availability, quality); b. routine maintenance c. monitoring d. data integrity (e.g. backups, anti-virus); e. consumables use, storage & disposal f. health & safety g. escalation h. information recording and reporting i. obtaining work permissions j. security & confidentiality. 1.2 describe system functionality during normal operation. 1.3 describe the effects of operational activities on system functionality

Learning outcome
The learner will: 2. Be able to operate systems
Assessment criteria
The learner can: 2.1 use and operate the system following appropriate procedures. 2.2 identify system faults and resolve or escalate system faults as appropriate. 2.3 gather and record specified operational information. 2.4 assess and minimise risks such as: a. loss or corruption of data; b. loss of service;

c. damage to equipment; d. effects on customer operations

Learning outcome
The learner will: 3. Be able to maintain and implement system operating procedures
Assessment criteria
The learner can: 3.1 provide advice and guidance on system operation to immediate colleagues. 3.2 select the procedures to be followed. 3.3 schedule operational activities to minimise disruption to system functionality. 3.4 collate operational information

Unit 867 System management

UAN:	**D/500/7332**
Level:	3
Credit value:	12
GLH:	100
Aim:	This unit aims to develop the knowledge and skills required to manage computer systems. The learner will gain knowledge of how the configuration of a computer system can affect the management of it. The learner will also develop an understanding of the importance of asset management. They will have an opportunity to use what they have learnt and modify a computer system according to guidelines given to them.

Learning outcome
The learner will: 1. Understand how to administer a system
Assessment criteria
The learner can: 1.1 describe how to configure the system. 1.2 describe ICT asset and configuration information applicable to the system such as: a. physical attributes (e.g. manufacturer, type, revision, serial number, location, value); b. configuration (e.g. physical and logical addresses, options set, connections). 1.3 describe how available options for system configuration affect functionality and capacity.

Learning outcome
The learner will: 2. Be able to administer a system and change system configurations
Assessment criteria
The learner can: 2.1 select configuration options to optimise system functionality and capacity. 2.2 make changes to system configuration. 2.3 specify items for which ICT asset and configuration information is to

be recorded.

Unit 868 User profile administration

UAN:	**K/500/7379**
Level:	3
Credit value:	9
GLH:	80
Aim:	This unit provides the underpinning knowledge to enable learners to configure and administer user profiles. Upon completion of this unit, learners will understand types of user profiles and how to assign permissions.

Learning outcome
The learner will: 1. Know how to administer user profiles
Assessment criteria
The learner can: 1.1 describe the organisational policy on user profiles such as: a. user identifier (eg. username); b. password and related information (e.g. change frequency); c. allowed system access (e.g. times, locations) 1.2 allowed access to facilities (e.g. data, software).. 1.3 describe how to create and edit user and standard profiles 1.4 describe how user profiles affect access to system facilities such as; a. shared resources (e.g. data storage, printers); b. software; c. data.

Learning outcome
The learner will: 2. Be able to administer user profiles
Assessment criteria
The learner can: 2.1 make specified changes to user profiles 2.2 specify user profiles to meet individual requirements 2.3 create standard profiles for groups of users 2.4 provide guidance on user profiles to immediate colleagues

Unit 871 Principles of information security testing

UAN:	**R/505/5815**
Level:	3
Credit value:	12
GLH:	69
Aim:	This unit provides the skills and knowledge necessary to test the information security that has been implemented on a system to establish its effectiveness. Upon successful completion of this unit, learners will be able to plan and carry out the security testing of information systems.

Learning outcome
The learner will: 1. Understand the test process and testing techniques in relation to information security
Assessment criteria
The learner can: 1.1 describe the impact on organisations and individuals of failures to preserve the confidentiality, integrity and availability of information systems 1.2 explain the role of testing in preserving the confidentiality, integrity and availability of information systems 1.3 explain the impact of information security on the test process 1.4 compare how static and dynamic testing techniques are applied to information security testing 1.5 describe how standard testing techniques are used when testing information security

Learning outcome
The learner will: 2. Understand the use of common tools for information security testing
Assessment criteria
The learner can: 2.1 describe how tools can be used to improve efficiency and reliability of information security testing 2.2 explain how to develop plans for information security testing

Learning outcome
The learner will: 3. Be able to carry out penetration testing
Assessment criteria
The learner can: 3.1 describe the role and applicability of penetration testing 3.2 describe common penetration testing techniques 3.3 carry out penetration testing according to given specifications

Unit 872 Principles of secure system development

UAN:	**K/505/5819**
Level:	3
Credit value:	6
GLH:	34
Aim:	This unit provides knowledge and skills required to ensure the secure development of systems. Upon completion of this unit, learners will understand the stages of the systems development life cycle (SDLC) and the associated security requirements.

Learning outcome
The learner will: 1. Understand the role of security in the systems development life cycle (SDLC)
Assessment criteria
The learner can: 1.1 describe common systems development life cycle (SDLC) models 1.2 explain the implications of not including security requirements in each stage of the SDLC 1.3 describe the factors that can influence security requirements including: 1.4 how critical the system is to the organisation 1.5 system requirements for confidentiality, integrity and availability 1.6 applicable regulations and policies 1.7 actual or potential threats in the environment where the system will operate 1.8 identify opportunities for including security requirements in each stage of the SDLC.

Unit 874 Data modelling

UAN:	**L/601/3203**
Level:	3
Credit value:	9
GLH:	75
Aim:	The aim of this unit is to teach the concepts of data modelling. The learner will be taught about the basic concepts; including entities, attributes and relationships, and will also learn the objectives of normalisation to 3rd normal form as well as putting this into practice. The learner will use what they have learnt to produce logical data model.

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 purpose of keys 1.5 describe an application where un-normalized 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. Be able to use data modelling techniques to create logical data models
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. Be able to use data modelling techniques to 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 describe the logical data model of a normalised data set

Unit 877 Carrying out electronic forensic examinations

Level:	4
Credit value:	12
GLH:	75
Aim:	This unit develops the skills necessary to undertake electronic forensic examinations following an issue involving information, to ensure that evidence is preserved. Upon completion, learners will be able to carry out the actions required to prevent evidence being compromised when investigating an issue involving information security.

Learning outcome
The learner will: 1. Be able to understand what evidence is
Assessment criteria
The learner can: 1.1 describe different types of evidence 1.2 discuss evidence's importance for e-disclosure as part of an investigation 1.3 demonstrate how to balance the competing demands of business continuity with evidence gathering 1.4 discuss the role of the expert witness and how it varies from a witness of fact

Learning outcome
The learner will: 2. Be able to understand what constitutes a crime
Assessment criteria
The learner can: 2.1 describe the components of a crime 2.2 Explain the principle of "burden of proof" 2.3 describe the importance of "burden of proof" to disclosure (e-disclosure)

Learning outcome
The learner will: 3. Be able to understand the roles that exist within an investigation
Assessment criteria

The learner can: 3.1 describe the different types of investigation that could be undertaken 3.2 describe the role of the forensic examiner 3.3 explain the responsibilities and liabilities of a forensic examiner

Learning outcome
The learner will: 4. Be able to understand the investigation steps
Assessment criteria
The learner can: 4.1 describe the investigation steps that are usually undertaken 4.2 explain how the investigation steps influence the forensic strategy 4.3 explain the importance of the chain of custody 4.4 discuss the key principles and methods that would be used in an investigation 4.5 explain the impact of the key principles and methods may have on an investigation 4.6 demonstrate recording of actions to withstand the scrutiny from independent third parties

Learning outcome
The learner will: 5. Understand data storage and the digital devise associated with data storage
Assessment criteria
The learner can: 5.1 describe where data can be stored and relevant storage devices 5.2 explain the problems posed for an investigation by the way data is stored 5.3 explain why operating systems may pose a problem for the investigation 5.4 discuss the problems posed by various digital devices for a forensic investigator

Learning outcome
The learner will: 6. Be able to understand different “anti-Forensic” techniques
Assessment criteria
The learner can: 6.1 describe a range of anti-forensic techniques 6.2 explain how to identify methods used for anti-forensic purposes 6.3 discuss what may be done to overcome anti-forensic techniques

Learning outcome
The learner will: 7. Be able to understand different methods of forensic examination and analysis

Assessment criteria
The learner can: 7.1 describe the advantages and disadvantages of live forensics 7.2 describe the advantages and disadvantages of dead forensics 7.3 explain when you would use live and dead forensics

Unit 878 Carrying out information security audits

UAN:	**A/505/5811**
Level:	4
Credit value:	12
GLH:	30
Aim:	This unit provides the knowledge and skills required to plan and undertake information security audits. Upon completion of this unit, learners will be able to plan and undertake security audits that can be used to manage any identified risks.

Learning outcome
The learner will: 1. Be able to prepare for information security audit activities
Assessment criteria
The learner can: 1.1 interpret given information security audit briefs to identify the information assets and system components to be audited 1.2 identify sources of information relating to the information assets and system components in scope 1.3 develop audit plans, following organisational procedures, which will ensure a thorough assessment of security compliance across the whole scope of the audit 1.4 verify audit scope and plans with relevant persons

Learning outcome
The learner will: 2. Be able to carry out information security audit activities
Assessment criteria
The learner can: 2.1 carry out information security audits following organisational procedures 2.2 critically review information and data relating to information assets and system components to assess security compliance 2.3 report any security non-compliance to the relevant persons in line with organisational procedures and timelines 2.4 report on audit activities following organisational procedures 2.5 make justified recommendations for actions to be taken to improve security compliance to relevant persons using media, format and structures which meet the needs of the intended audience

Unit 879 Carrying out information security forensic examinations

UAN:	**M/505/5806**
Level:	4
Credit value:	9
GLH:	20
Aim:	This unit covers the knowledge and skills necessary to undertake forensic examinations following issues involving information to ensure evidence is preserved. Learners achieving this unit will be able to carry out the activities necessary to prevent evidence being compromised when investigating an issue involving information security.

Learning outcome
The learner will: 1. Be able to carry out information security forensic examinations
Assessment criteria
The learner can: 1.1 carry out forensic examinations following organisational procedures 1.2 analyse system information for evidence of actual or attempted breaches of security policy or legislation 1.3 report any identified actual or attempted breaches of security to the relevant persons following organisational procedures and timelines 1.4 use security tools to analyse the integrity of software 1.5 take actions to secure information assets and system components subject to actual or attempted breaches of security in line with organisational timelines 1.6 with the authorisation of relevant persons, seize evidence in accordance with legislation and following organisational procedures 1.7 seize evidence, minimising disruption to the organisation and maintaining evidential integrity

Unit 880 Carrying out information security incident management activities

UAN:	**J/505/5813**
Level:	4
Credit value:	12
GLH:	35
Aim:	This unit covers planning and undertaking activities involved in responding to an incident involving information security. Upon successful completion, learners can undertake activities associated with responding to an incident, making recommendations in line with organisational policies.

Learning outcome
The learner will: 1. Be able to prepare for information security incident management
Assessment criteria
The learner can: 1.1 interpret given incident investigation briefs to identify the scope of the incidents to be managed 1.2 verify the scope of identified incidents with relevant persons 1.3 evaluate sources of evidence relating to identified incidents.

Learning outcome
The learner will: 2. Be able to manage information security incidents
Assessment criteria
The learner can: 2.1 obtain evidence relating to identified incidents, following organisational procedures 2.2 critically review evidence to determine appropriate investigative actions 2.3 make justified recommendations for investigative actions to relevant persons using media, format and structures which meet the needs of the intended audience 2.4 report on incident investigation following organisational procedures 2.5 critically evaluate organisational procedures for Incident Investigation.

Unit 881 Carrying out information security risk assessment

UAN:	**A/505/5792**
Level:	4
Credit value:	12
GLH:	40
Aim:	This unit covers the knowledge and skills necessary to plan and undertake an information security risk assessment. Upon completion of the unit, learners will be able to interpret risk assessment briefs and identify the information required to allow them to plan and carry out an effective security risk assessment.

Learning outcome
The learner will: 1. Be able to prepare for information security risk assessments
Assessment criteria
The learner can: 1.1 interpret given risk assessment briefs to identify the information assets and system components to be assessed 1.2 verify the scope of identified information assets and system components with relevant persons 1.3 evaluate sources of information relating to potential risks that may impact on the security of identified information assets and system components

Learning outcome
The learner will: 2. Be able to carry out information security risk assessments
Assessment criteria
The learner can: 2.1 use a range of investigative methods to gather information relating to potential risks that may impact on the security of identified information assets and system components 2.2 record all gathered information in line with organisational requirements 2.3 analyse gathered information to identify risks to the security of identified information assets and system components 2.4 assess identified risks to determine their probability of occurrence and potential impact

2.5	evaluate risks against organisational risk tolerance levels
2.6	report any risks which exceed organisational risk tolerance levels to the relevant persons following organisational procedures and timelines
2.7	formulate actions to mitigate risks
2.8	report the results of risk assessment in line with organisational procedures
2.9	communicate the results and implications of risk assessments to relevant persons using media, format and structures which meet the needs of the intended audience
2.10	evaluate organisational procedures for risk assessment

Unit 882 Carrying out information security risk management

UAN:	**L/505/5814**
Level:	4
Credit value:	12
GLH:	40
Aim:	This unit enables learners to develop the knowledge and skills necessary to carry out information security risk management. Upon completion of the unit, learners will be able to plan and undertake tasks associated with risk management to mitigate any risks to systems and networks.

Learning outcome
The learner will: 1. Be able to develop information security risk contingency plans
Assessment criteria
The learner can: 1.1 interpret given risk management briefs to identify the information assets and system components to be covered by the risk contingency plan 1.2 verify the scope of identified information assets and system components with relevant persons 1.3 develop risk contingency plans on a given analysis of the probability and impact of all identified risks 1.4 justify the range of response actions that may be used to mitigate risks 1.5 evaluate risk contingency plans against external standards and legislation 1.6 record information security risk contingency plans in line with organisational requirements

Learning outcome
The learner will: 2. Be able to manage information security risks
Assessment criteria
The learner can: 2.1 manage defined response actions to risks which impact the integrity of information assets and system components following organisational procedures and timelines 2.2 report any risks arising for which no response actions have been

defined to the relevant persons following organisational procedures and timelines 2.3 report on information security risk management activities following organisational procedures 2.4 communicate the results and implications of risk management activities to relevant persons using media, format and structures which meet the needs of the intended audience 2.5 evaluate organisational procedures for risk management

Unit 883 Designing and developing event-driven computer programs

UAN:	**J/601/3300**
Level:	4
Credit value:	15
GLH:	90
Aim:	The aim of this unit is to teach the concepts of event driven programming. In order to do this the learner will learn some of the features of an event driven environment such as using standard input and output commands and use the integrated development environment effectively. They will have an opportunity to use what they have learnt by modifying an existing program to improve its quality. The learner will test their amended cost against actual and expected outcomes. Lastly the learner will develop design documentation for use in program maintenance as well as end user documentation such as a user guide.

Learning outcome
The learner will: 1. Be able to design event-driven programs to address loosely defined problems
Assessment criteria
The learner can: 1.1 identify and structure the components and data required to address problems 1.2 select and use pre-defined components, specialising as required 1.3 identify the set of events that invoke behaviour of components and other programme elements 1.4 specify the behaviour of components and other program elements to allow efficient implementation, selecting appropriate data types, data and file structures and algorithms 1.5 record the design using well-established notations

Learning outcome
The learner will: 2. Be able to produce a working event-driven program which meets the design specification
Assessment criteria
The learner can: 2.1 make effective use of basic programming language features and programming concepts to implement a program that satisfies the design specification 2.2 make effective use of the features of the programming environment 2.3 make effective use of user interface components in the implementation of the program 2.4 make effective use of a range of debugging tools

Learning outcome
The learner will: 3. Be able to develop event-driven programs that reflect established programming and software engineering practice
Assessment criteria
The learner can: 3.1 apply standard naming, layout and comment conventions 3.2 apply appropriate data validation and error handling techniques

Learning outcome
The learner will: 4. Be able to develop test strategies and apply these to event-driven programs
Assessment criteria
The learner can: 4.1 develop and apply a test strategy consistent with the design identifying appropriate test data 4.2 apply regression testing consistent with the test strategy 4.3 use appropriate tools to estimate the performance of the program

Learning outcome
The learner will: 5. Be able to develop design documentation for use in program maintenance and end-user documentation
Assessment criteria
The learner can: 5.1 record the final state of the program in a form suitable for subsequent maintenance 5.2 provide end-user documentation that meets the user's needs

Unit 884 Designing and developing object-oriented computer programs

UAN:	**T/601/3308**
Level:	4
Credit value:	15
GLH:	90
Aim:	The aim of this unit is to teach the concepts of designing and developing object-orientated programs. As part this unit, the learner will learn some of the key elements of object-orientated languages such as how to declare file structures and how to use some of the predefined functions. The learner will have an opportunity to use what they have learnt to modify an existing program to improve its quality or write a new program. The learner will test the revised code and record expected and actual results.

Learning outcome
The learner will: 1. Be able to design object-oriented programs to address loosely defined problems
Assessment criteria
The learner can: 1.1 identify a set of classes and their interrelationships to address the problem 1.2 make effective use of encapsulation, inheritance and polymorphism 1.3 select and reuse pre-existing objects and templates specialising as required 1.4 structure the design so that objects communicate efficiently 1.5 specify the properties and behaviour of classes to allow efficient implementation, selecting appropriate data types, data and file structures and algorithms 1.6 record the design using well-established notations

Learning outcome
The learner will: 2. Be able to produce a working object-oriented program which meets the design specification
Assessment criteria
The learner can: 2.1 make effective use of basic programming language features and programming concepts to implement a program that satisfies the design specification 2.2 make effective use of the features of the programming environment 2.3 make effective use of user interface components in the implementation of the program 2.4 make effective use of a range of debugging tools

Learning outcome
The learner will: 3. Be able to develop object-oriented programs that reflect established programming and software engineering practice
Assessment criteria
The learner can: 3.1 apply standard naming, layout and comment conventions 3.2 apply appropriate data validation and error handling techniques

Learning outcome
The learner will: 4. Be able to develop test strategies and apply these to object-oriented programs
Assessment criteria
The learner can: 4.1 develop and apply a test strategy consistent with the design identifying appropriate test data 4.2 apply regression testing consistent with the test strategy 4.3 use appropriate tools to estimate the performance of the program

Learning outcome
The learner will: 5. Be able to develop design documentation for use in program maintenance and end-user documentation
Assessment criteria
The learner can: 5.1 record the final state of the program in a form suitable for subsequent maintenance 5.2 provide end-user documentation that meets the user's needs

Unit 885 Designing and developing procedural computer programs

UAN:	**T/601/3311**
Level:	4
Credit value:	15
GLH:	90
Aim:	The aim of this unit is to teach the concepts of procedural programming. As part this unit the learner will learn some of the key elements of a procedural language such as how to declare file structures and how to use some of the predefined functions. They will have an opportunity to use what they have learnt by modifying an existing program to improve its quality. They will test the revised code and record expected and actual results. Lastly the learner will develop design documentation for use in program maintenance as well as end user documentation such as a user guide.

Learning outcome
The learner will: 1. Be able to design procedural programs to address loosely defined problems
Assessment criteria
The learner can: 1.1 identify and structure procedures and functions to address problems 1.2 select and use library functions and procedures 1.3 structure the design with regard to coupling and cohesion 1.4 specify the behaviour of functions and procedures to allow efficient implementation, selecting appropriate data types, data and file structures and algorithms 1.5 record the design using well-established notations

Learning outcome
The learner will: 2. Be able to produce a working procedural program which meets the design specification

Assessment criteria
The learner can: 2.1 make effective use of basic programming language features and programming concepts to implement a program that satisfies the design specification 2.2 make effective use of the features of the programming environment 2.3 make effective use of user interface components in the implementation of the program 2.4 make effective use of a range of debugging tools

Learning outcome
The learner will: 3. Be able to develop procedural programs that reflect established programming and software engineering practice
Assessment criteria
The learner can: 3.1 apply standard naming, layout and comment conventions 3.2 apply appropriate data validation and error handling techniques

Learning outcome
The learner will: 4. Be able to develop test strategies and apply these to procedural programs
Assessment criteria
The learner can: 4.1 develop and apply a test strategy consistent with the design identifying appropriate test data 4.2 apply regression testing consistent with the test strategy 4.3 use appropriate tools to estimate the performance of the program

Learning outcome
The learner will: 5. Be able to develop design documentation for use in program maintenance and end-user documentation
Assessment criteria
The learner can: 5.1 record the final state of the program in a form suitable for subsequent maintenance 5.2 provide end-user documentation that meets the user's needs

Unit 886 Human computer interaction

UAN:	**A/601/0457**
Level:	4
Credit value:	15
GLH:	60
Aim:	The purpose of this unit is to provide learners within an understanding of the principles of Human Computer Interaction and its impact on business and industry. Learners will have the opportunity to research current developments in HCI, in order to develop their understanding of the range of issues addressed in the field, prior to designing an effective user interface. Learners will also evaluate interfaces and understand how to measure their effectiveness.

Learning outcome
The learner will: 6. Understand recent human computer interaction related developments and their application
Assessment criteria
The learner can: 6.1 Evaluate recent **HCI related developments** and their applications 6.2 Discuss the **impact of HCI** in the workplace.

Range
HCI-related developments
Core theories, models and methodologies
End user development, embedded computation, virtual and augmented reality, 3D interfaces, remote control, specialist needs, thought input, intelligent interfaces, user-centred design
Applications for range of platforms and devices: mobile devices; Graphical user interfaces and web interfaces; games devices; hostile environments; large display; domestic appliances; collaborative and social media; visual systems
Impact of HCI
Staff impact: cultural, psychological, sociological, behavioural factors
Business impact: productivity, training need, time to competence, accuracy of changing computing environment: social, economic, cultural impact
DDA compliance

Learning outcome
The learner will: 7. Understand the issues related to a chosen human computer interface
Assessment criteria
The learner can: 7.1 Discuss the issues related to **user characteristics** for a chosen HCI

Range
User characteristics Features; input and output methods and devices, form and content Presentation: clarity, consistency, style, layout, colour Navigation and control elements, Interactivity, user focus, personalization, user experience Specialist needs, adaptation of interfaces Response times, task efficiency, system capability, user assistance/help Cognitive aspects: memory, retention, attention, perception Health and safety considerations: ergonomics, legal implications Training requirements, documentation, Cost

Learning outcome
The learner will: 8. Be able to develop a human computer interface
Assessment criteria
The learner can: 8.1 **Design and create** a human computer interface for a specified application 8.2 Explain the **principles that have been applied** to the design 8.3 Critically **review** and test an interface 8.4 **Analyse actual test results** against expected results to identify discrepancies 8.5 **Evaluate independent feedback** and make recommendations for improvements 8.6 Create onscreen help to assist the users of an interface 8.7 Create **documentation** for the support and maintenance of an interface

Range
Design and create Requirements gathering, user analysis, information design, HCI options, visual design prototyping, (eg picture boards, storyboards, flowcharts, structured diagrams, narrative), graphic interface design Use of interactive and animated features, multimedia, using features of application (eg GPS on mobile device, touchscreen) as appropriate Use of graphic editors, graphic programming environment Performance or response requirements **Principles that have been applied** Fitts law, Keystroke level method Optimisation eg for ease of use, learnability, stress reduction, efficiency, controllability Tolerance, simplicity, visibility, affordance, consistency, structure, feedback International standards, organisational guidelines **Review** Effectiveness, efficiency, user satisfaction. Functionality **Analyse actual test results** Quantitative measures: load speed, input/output speed, resource requirement, development and maintenance cost. Controlled experiments. Qualitative methods: Comparison with requirements; comparison with other systems Usability testing **Evaluate independent feedback** Evaluation methods, user study, survey, software tools, expert review User satisfaction: eg ease of use, skills required, Results generated; managing constraints **Documentation** Specification, design, user guide, test log, site map

Unit 887 Investigating and defining customer requirements for ICT systems

UAN:	**R/602/1772**
Level:	4
Credit value:	15
GLH:	90
Aim:	This unit shows learners how to investigate and define customer requirements for ICT systems. Learners will use different methods of investigation, learn how to record their findings and present them to colleagues. They will also be shown how to analyse information and identify the needs and constraints in meeting the requirements of their customers.

Learning outcome
The learner will: 1. Be able to control the investigation of existing and proposed systems and processes
Assessment criteria
The learner can: 1.1 select and use the investigative methods which will elicit relevant information about existing and proposed systems and processes 1.2 create the documentation required to record the results of investigations 1.3 ensure that investigative methods are applied correctly and all relevant information is recorded using standard documentation 1.4 ensure that the confidentiality of customer information is preserved 1.5 provide advice and guidance to colleagues on investigation and analysis of information

Learning outcome
The learner will: 2. Be able to analyse information to identify needs and constraints
Assessment criteria
The learner can: 2.1 explain the types of defect and their causes which can arise in information 2.2 describe methods of minimising defects in information. 2.3 explain how customer needs and constraints can affect the design of an ICT system 2.4 analyse information to identify customer needs and priorities for: a. data to be stored and processed b. functionality in terms of inputs, processes and outputs c. capacity including numbers of users, throughput, and data storage 2.5 analyse information to identify customer constraints 2.6 verify that identified needs, priorities and constraints meet customer requirements

Unit 888 Investigating information security incidents

UAN:	**D/505/5798**
Level:	4
Credit value:	12
GLH:	35
Aim:	This units develops the necessary skills and knowledge to gather and analyse information regarding an information security incident. Learners will be able to interpret information gathered to identify the impact of the incident and make recommendations about the mitigation of risks.

Learning outcome
The learner will: 1. Be able to prepare for information security incident investigations
Assessment criteria
The learner can: 1.1 interpret given incident investigation briefs to identify the scope of the incidents to be investigated 1.2 verify the scope of identified incidents with relevant persons 1.3 evaluate sources of evidence relating to identified incidents

Learning outcome
The learner will: 2. Be able to investigate information security incidents
Assessment criteria
The learner can: 2.1 obtain evidence relating to identified incidents, following organisational procedures 2.2 critically review evidence to determine appropriate investigative actions 2.3 make justified recommendations for investigative actions to relevant persons using media, format and structures which meet the needs of the intended audience 2.4 report on incident investigation following organisational procedures 2.5 critically evaluate organisational procedures for incident investigation

Unit 889 IT and telecoms system management

UAN:	**M/504/5504**
Level:	4
Credit value:	15
GLH:	90
Aim:	This unit provides the understanding of managing IT & telecoms systems and the skills required. Upon completion of the unit, learners will know how to configure IT & telecoms systems to meet customer requirements and review existing configurations, making recommendations about how these may be optimised.

Learning outcome
The learner will: 1. Understand how to manage systems
Assessment criteria
The learner can: 1.1 explain how to align system functionality with organisational objectives and customer needs 1.2 explain the types of configuration and asset information associated with systems 1.3 explain the types and applications of system management and monitoring tools

Learning outcome
The learner will: 2. Be able to review the functionality and management of systems
Assessment criteria
The learner can: 2.1 evaluate the functionality of systems against organisational objectives and customer needs to identify possible improvements 2.2 evaluate current system configuration and asset information to identify possible enhancements to performance and capacity 2.3 assess current system management and monitoring tools, and their use, suggesting possible improvements 2.4 review, and where necessary update, working procedures for system management 2.5 evaluate the impact of regulatory requirements on system management

Learning outcome
The learner will: 3. Be able to manage systems
Assessment criteria
The learner can: 3.1 select and implement configuration options to optimise system performance and capacity 3.2 ensure that changes made to system configurations are effective 3.3 recognise and resolve any system problems arising from configuration changes 3.4 audit records of system configuration and asset information for completeness and accuracy 3.5 evaluate potential risks, including security threats, to systems 3.6 contribute to the development of the organisation's system management strategy

Unit 890 IT and telecoms system operation

UAN:	**R/504/5513**
Level:	4
Credit value:	15
GLH:	90
Aim:	This unit develops learners' understanding of the architecture used in IT & telecoms systems. Upon successful completion, learners will know how to maintain IT & telecoms systems and review existing configurations, making recommendations about how these may be optimised.

Learning outcome
The learner will: 1. Understand the technical architecture of it or telecom systems
Assessment criteria
The learner can: 1.1 explain the technical architecture of a system and describe alternative approaches 1.2 explain the contribution to overall system functionality of the main physical and logical components of the system 1.3 explain how system components can be physically and logically interconnected 1.4 describe the external connections of the system and how they are used 1.5 explain the facilities available for controlling and monitoring the operation of the system

Learning outcome
The learner will: 2. Understand how to specify system operation parameters
Assessment criteria
The learner can: 2.1 explain how the expected functionality and capacity of the system has been specified 2.2 explain how qualitative and quantitative measures of system operation have been derived from functionality and capacity specifications

2.3	explain how the system can be controlled to optimise performance
2.4	explain how monitoring can be used to measure the qualitative and quantitative operation of the system
2.5	describe the routine maintenance or replenishment required to maintain normal system operation

Learning outcome
The learner will: 3. Be able to control the operation of systems
Assessment criteria
The learner can: 3.1 select the control facilities to be used and document how they are to be used to optimise system operation 3.2 select the monitoring facilities to be used and document how they are to be used to identify actual and potential deviations from normal system operation 3.3 define and implement procedures to check the validity of reported deviations from normal system operation 3.4 define and implement procedures to investigate identified and reported deviations to identify required corrective actions 3.5 define the system performance information to be recorded

Learning outcome
The learner will: 4. Be able to control system maintenance
Assessment criteria
The learner can: 4.1 define and implement procedures to schedule maintenance and replenishment activities to minimise disruption to system operation 4.2 define and implement procedures to ensure that maintenance activities are carried out safely and in accordance with relevant regulations 4.3 define and implement procedures to ensure that system users are promptly informed of changes to system availability or performance during maintenance activities 4.4 define the maintenance and replenishment information to be recorded

Unit 891 Testing the security of information systems

UAN:	**A/505/5789**
Level:	4
Credit value:	15
GLH:	60
Aim:	This unit aims to develop the knowledge and skills required to test the information security implemented on a system to establish its effectiveness. Upon completion of this unit, learners will be able to plan and carry out the security testing of information systems using a verity of tools/methods.

Learning outcome
The learner will: 1. Be able to plan security testing
Assessment criteria
The learner can: 1.1 develop a context driven test approach to systematically test specified parts of a system in order to assess their information security status 1.2 analyse given information assurance requirements to produce information security test acceptance criteria 1.3 develop test scripts and plans to ensure that all information assurance requirements are tested 1.4 prioritise testing activity to target the most significant threats and vulnerabilities first 1.5 select, and where necessary adapt, methods, tools and techniques to conduct penetration testing 1.6 define all required test preparation and conclusion activities

Learning outcome
The learner will: 2. Be able to carry out security testing
Assessment criteria
The learner can: 2.1 ensure that all required preparations are implemented, in line with test plans, prior to carrying out tests 2.2 apply test methods, tools and techniques following organisational procedures

2.3	record the results of tests using organisational documentation
2.4	ensure that all required activities have been correctly implemented following the completion of testing in line with test plans
2.5	critically evaluate the results of testing to accurately identify specific vulnerabilities
2.6	prioritise identified vulnerabilities against information assurance requirements
2.7	determine and justify actions to mitigate identified vulnerabilities
2.8	report the results of test activities following organisational procedures
2.9	communicate the results and implications of test activities to relevant persons using media, format and structures which meet the needs of the intended audience
2.10	evaluate organisational procedures for carrying out security testing

Unit 892 Website design

UAN:	**J/601/1286**
Level:	4
Credit value:	15
GLH:	60
Aim:	The purpose of this unit is to provide learners with the understanding and skills needed to design, implement and test interactive websites.

Learning outcome
The learner will: 1. Understand website design concepts
Assessment criteria
The learner can: 1.1 Discuss the **design concepts** that have to be considered when designing a web site

Range
design concepts Intended audience Intended users Information only Real-time environment Data capture Internal navigation External connectivity Graphics Interface Content Mobile devices Data Protection Copyright Animation/sound

Learning outcome
The learner will: 2. Be able to design interactive websites
Assessment criteria
The learner can: 2.1 Design an interactive website to meet given requirements 2.2 **Evaluate website design** with other users

Range
Evaluate website design User feedback User forums Site comparison Disaster recovery Security

Learning outcome
The learner will: 3. Be able to implement interactive websites
Assessment criteria
The learner can: 3.1 implement a **fully functional interactive website** using a design specification.

Range
Fully functional interactive website Specification Layout Navigation Pages Frames Toolbox components Internal navigation External connectivity Content Animation/sound Help files Shopping cart Compliances

Learning outcome
The learner will: 4. Be able to test interactive websites
Assessment criteria
The learner can: 4.1 Critically review and test the website 4.2 Analyse actual test results against expected results to identify discrepancies 4.3 Evaluate independent feedback and make recommendations for improvements 4.4 Create onscreen help to assist the users 4.5 Create documentation for the support and maintenance of the website

Unit 893 Website management

UAN:	**R/601/1288**
Level:	4
Credit value:	15
GLH:	60
Aim:	The purpose of this unit is to provide learners with the understanding and skills necessary for managing and maintaining websites.

Learning outcome
The learner will: 1. Understand the functions of website hosting
Assessment criteria
The learner can: 1.1 Explain the **methods and techniques required** to host a website 1.2 Evaluate the different **services offered by web host providers** 1.3 Explain **the legal requirements** of hosting an online website

Range
Methods and techniques required Web server Bandwidth Storage capacity IP address Direct internet connectivity Routers Listening software Performance/maintenance software **Services offered by web host providers** Data centre space Web management Protection Email hosting Redirection Visitor analysis **The legal requirements** Displaying company information

- Companies Act
- Business Names Act

Privacy policy

- Data Protection Act

Terms and Conditions

- Consumer Protection Regulations
- EU Electronic Commerce Regulations

Web Accessibility and the Disability Discrimination Act

Payment Card Industry Data Security Standard (PCI DSS)

- e-Commerce Regulations
- Financial transaction security

EU Anti-Spam

- Opt in
- Opt out
- Statements

EU Cookie Directive

- Consents

Learning outcome
The learner will: 2. Be able to upload and manage websites
Assessment criteria
The learner can: 2.1 Demonstrate the **upload of a website** to a web server 2.2 Perform **website maintenance to sustain maximum efficiency** and performance

Range
Upload of a website User account/ISP FTP Web files **Website maintenance to sustain maximum efficiency** Access speed Optimisation Connection speed testing Updating web files

Learning outcome
The learner will: 3. Be able to improve website performance
Assessment criteria
The learner can: 3.1 Discuss how to monitor the **performance of a website** 3.2 Analyse **statistics relating to visitors** accessing a website 3.3 Explain the **methods and techniques used to gather visitor feedback** for a website

Range
Performance of a website Access speed Connection speed testing Internal/external links Web host information/analysis Site visitor feedback **Statistics relating to visitors** Hit counter Visitor tracking services Visitor status/access history Visitor location Search keywords used by visitors Visitor browser information Visitor access times Tracking individual IP Sources of website traffic **Methods and techniques used to gather visitor feedback** Webpage feedback tools Web rating Email Visitor comments page Hit counter

Learning outcome
The learner will: 4. Be able to promote websites
Assessment criteria
The learner can: 4.1 Explain the methods and techniques required to promote a website 4.2 Evaluate the different **features that are available to enhance and upgrade a website**

Range
Features that are available to enhance and upgrade a website
User forums
Video/sound
Email
Improving access speeds
Free services/downloads
Visitor feedback
Currency of content
Ease of use
Site map
Payment facilities

Relationships to other qualifications

Links to other qualifications

These qualifications have connections to the:

- Level 1 and Level 2 ITQ for IT Users (7574)
- Level 2 ICT Professional Competence (4520-01, 02 and 03)
- Level 2 Communications Cabling (3666/3667)

Literacy, language, numeracy and ICT skills development

These qualifications can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see **www.cityandguilds.com/functionalskills**
- Essential Skills (Northern Ireland) – see **www.cityandguilds.com/essentialskillsni**
- Essential Skills Wales – see **www.cityandguilds.com/esw**

Appendix 1 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the Centre Document Library on www.cityandguilds.com or click on the links below:

Quality Assurance Standards: Centre Handbook

This document is for all approved centres and provides guidance to support their delivery of our qualifications. It includes information on

- Centre quality assurance criteria and monitoring activities
- Administration and assessment systems
- Centre-facing support teams at City & Guilds / ILM
- Centre quality assurance roles and responsibilities.

The Centre Handbook should be used to ensure compliance with the terms and conditions of the Centre Contract.

Quality Assurance Standards: Centre Assessment

This document sets out the minimum common quality assurance requirements for our regulated and non-regulated qualifications that feature centre assessed components. Specific guidance will also be included in relevant qualification handbooks and/or assessment documentation.

It incorporates our expectations for centre internal quality assurance and the external quality assurance methods we use to ensure that assessment standards are met and upheld. It also details the range of sanctions that may be put in place when centres do not comply with our requirements, or actions that will be taken to align centre marking/assessment to required standards. Additionally, it provides detailed guidance on the secure and valid administration of centre-assessments.

Access arrangements - When and how applications need to be made to City & Guilds provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The Centre Document Library also contains useful information on such things as:

- Conducting examinations
- Registering learners
- Appeals and malpractice

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group is a leader in global skills development. Our purpose is to help people, organisations and economies develop their skills for growth. We work with education providers, employers and governments in over 100 countries across the world to help people, businesses and economies grow by shaping skills systems and supporting skills development.

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