

LEVEL 4 DIPLOMA IN COMPUTING (L4DC)

NCC Education
Qualification Unit Specification
2024 / 25



LEVEL 4 DIPLOMA IN COMPUTING (L4DC)

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1. About NCC Education

NCC Education is a UK awarding body, active in the UK and internationally. Originally part of the UK National Computing Centre, NCC Education started offering IT qualifications in 1976 and from 1997 developed its Higher Education portfolio to include Business qualifications, IT qualifications for school children and a range of Foundation qualifications.

With Centres in over fifty countries, four international offices and academic managers worldwide, NCC Education strives to employ the latest technologies for learning, assessment and support. NCC Education is regulated and quality assured by Ofqual (the *Office of Qualifications and Examinations Regulation*, see (www.ofqual.gov.uk) in England.

1. Why choose this Qualification

NCC Education's Level 4 Diploma in Computing is:

- **Regulated** by Ofqual and Qualification Wales (QiW) and listed on the Qualifications and Credit Framework – Qualification Number 600/0406/X. The Regulated Qualifications Framework (RQF) is a credit-based qualifications framework, allowing candidates to take a unit-based approach to building qualifications. For more information see: <https://www.gov.uk/what-different-qualification-levels-mean/list-of-qualification-levels>
- **Quality assured** and well established in the UK and worldwide
- **Recognised and valued** by employers and universities worldwide

NCC Education's Level 4 Diploma in Computing is a pathway qualification for candidates who wish to complete the NCC Education degree journey. This qualification is equivalent to the first year of a Computing degree qualification in the UK university system and will allow access to the NCC Education Level 5 Diploma in Computing and the NCC Education Level 5 Diploma in Computing (with Business Management).

The Level 4 Diploma in Computing (with Business Management) is the first year of the NCC Education degree journey. The qualification is equivalent to the first year of a Business IT degree qualification in the UK university system.

This course is designed to develop essential thinking and study skills in IT and Business through a balance of academic and vocational subjects. Students can contribute to the development of computer systems and networks, databases, and websites in a business context, whilst also developing an awareness of business needs.

The programme will allow students to enter the IT and Business professions with the necessary knowledge expected within the industry and will be able to apply these skills to a range of IT-related functions.

- **Objective**

Candidates will be exposed to both the academic and vocational aspects of a wide range of computing-related subjects, enabling them to gain the necessary knowledge and skills vital for a career in the computing/business sectors or further studies.

2. Structure of the L4DC Qualification

Qualification Title, Credits, Units

**NCC Education's Level 4 Diploma in Computing (RQF), 120 credits, all at RQF Level 4
Total Qualification Time: 1200 hours**

Specialist pathways are included within brackets in the qualification title:

- **NCC Education Level 4 Diploma in Computing**
- **NCC Education Level 4 Diploma in Computing (with Business Management)**

Guided Learning Hours:

- **NCC Education Level 4 Diploma in Computing: 479 hours**
- **NCC Education Level 4 Diploma in Computing (with Business Management): 395 - 431 hours**

Please see Section 5 below for Syllabuses, which include the Guided Learning Hours and Total Qualification Time for each Unit of the Level 4 Diploma in Computing.

Candidates must pass all 8 Units to be awarded the Level 4 Diploma in Computing certificate.

Core Units

Algorithms and Mathematical Concepts for Computing (TQT: 150 hours/ 15 credits)	Computer Networks (TQT: 150 hours/ 15 credits)	Computer Systems (TQT: 150 hours / 15 credits)
Databases (TQT: 150 hours/ 15 credits)	Front-End Web Development (TQT: 150 hours/ 15 credits)	

Specialist Units

Object-Oriented System Analysis and Design (TQT: 150 hours/ 15 credits)	Software Engineering (TQT: 150 hours/ 15 credits)	Designing and Developing Object-Oriented Computer Programmes (TQT: 150 hours/ 15 credits)
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- **NCC Education Level 4 Diploma in Computing (with Business Management)**

Candidates must pass 4 Core, 3 Specialist and 1 Elective Units to be awarded the Level 4 Diploma in Computing (with Business Management) certificate.

Core Units

Computer Networks (TQT: 150 hours/ 15 credits)	Computer Systems (TQT: 150 hours / 15 credits)
Databases (TQT: 150 hours/ 15 credits)	Front-End Web Development (TQT: 150 hours/ 15 credits)

Mandatory Specialist Units

eBusiness (TQT: 150 hours/ 15 credits)	Understanding Business Organisation (TQT: 150 hours/ 15 credits)	Essentials of Management (TQT: 150 hours / 15 credits)
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Elective Units

Algorithms and Mathematical Concepts for Computing (TQT: 150 hours/ 15 credits)	Software Engineering (TQT: 150 hours/ 15 credits)	Designing and Developing Object-Oriented Computer Programmes (TQT: 150 hours/ 15 credits)
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3. Assessment for the Qualification

1. Assessment Objectives

All assessment for the qualification is intended to allow candidates to demonstrate they have met the relevant Learning Outcomes. Moreover, NCC Education's assessment is appropriate to the assessment criteria as stated in this specification and is regularly reviewed to ensure it remains consistent with the specification.

2. Overview of the Qualification Unit Assessment

Unit	Assessment Methods	
	Global Assignment	Global Exam
Algorithms and Mathematical Concepts for Computing	60%	40%
Computer Networks	60%	40%
Computer Systems	60%	40%
Databases	60%	40%
Designing and Developing Object-Oriented Computer Programmes	100%	-
Object-Oriented System Analysis and Design	60%	40%
Software Engineering	100% (Mini Project + Report)	
Front End Web Development	100%	-
eBusiness	100%	
Understanding Business Organisation	100%	
Essentials of Management	100%	

The overall Unit mark is computed from the weighted mean of its components. The pass mark for a Unit is 40%.

4. Administration

1. Assessment Cycles

Four assessment cycles are offered throughout the year Spring, Summer, Autumn, and Winter. Details of each assessment cycle with corresponding dates can be found within the Activity Schedules.

Examination dates and assignment submission deadlines are published in the NCC Education Activity Schedule, which is provided to Centres by Customer Services. It is also available on Quartz, NCC Education's student registration system.

The Activity Schedule also gives the key dates for registering candidates for assessment cycles, the dates when Centres can expect the assessment documentation and, ultimately, the assessment results from NCC Education.

2. Language of Assessment

All assessment is conducted in English.

3. Candidates

NCC Education's qualifications are available to those Centre candidates who satisfy the entry requirements as stated in this specification.

4. Qualification Entry Requirements

- Holders of the NCC Education Level 3 International Foundation Diploma for Higher Education Studies (L3IFDHES).
- Holders of the NCC Education Level 3 Diploma in Computing (L3DC) (RQF).
- Holders of the Level 3 Diploma in Business (L3DB) (RQF) for candidates studying the Level 4 Diploma in Computing (with Business Management) specialism.
- Holders of any local or international qualification deemed to be a similar level to either L3DC or L3IFDHES. These is to be agreed in advance with NCC Education.
- Holders of one 'A' level or equivalent or an appropriate School Leaver's certificate deemed to be of a similar level passed and approved by NCC Education.
- Mature students, able to demonstrate over two years' relevant work experience and have an 'O' Level/GCSE/iGCSE English and Maths or equivalent.

For candidates whose first language is not English:

- IELTS 5.5 or equivalent.
OR
- GCSE/iGCSE 'O' Level English 'C' '4' or equivalent*
OR
- Alternatively, students can take the free NCC Education Higher English Placement Test, at one of our Accredited Partner Centres.

*Centres need to provide evidence to justify any equivalency decision (both qualification equivalency and grade equivalency) they make pertaining to any enrolments via non-GCSE or non-standard routes.

5. Eligibility Period

The maximum period of time that NCC Education allows for the completion of your programme is three years. Please contact your Accredited Partner Centre if you have any queries relating to this.

6. Resits

If a candidate fails an assessment, they will be provided with opportunities to resit during the eligibility period. Candidates may only seek reassessment in a previously failed Unit.

5. Syllabus

1. Algorithms and Mathematical Concepts for Computing

Title	Algorithms and Mathematical Concepts for Computing
Unit reference number	M/651/1145
Credits	15
Level	4
Type	Core/Elective

Guided Learning Hours	48 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Explain and use Computational Thinking	1.1 Explain the concept of Computational Thinking and its role in Computer Science. 1.2 Explain the role of modelling for developing solutions to complex computing problems. 1.3 Develop algorithms for well-defined problems.
2. Explain and apply Boolean algebra concepts and notation.	2.1 Explain Boolean operators, their precedence and discuss their use in computing. 2.2 Draw logic diagrams and write corresponding Boolean expressions. 2.3 Draw truth tables for Boolean expressions.
3. Explain and use propositional logic concepts and notation	3.1 Explain the use of propositional logic in Computer Science and AI. 3.2 Identify propositions and connectives (operators) in statements consisting of sentences. 3.3 Use truth tables to evaluate propositions. 3.4 Discuss the limitations of propositional logic. 3.5 Explain syllogistic reasoning and its use in formal logic.
4. Explain and use simple predicate logic statements	4.1 Explain the terms predicate, quantifier and function that use of predicate logic in Computer Science and AI. 4.2 Write, interpret and explain simple statements involving quantifiers.
5. Understand and explain number based system	5.1 Recognise and differentiate various types of numbers, including whole numbers, integers, fractions, relational numbers, real numbers, prime numbers, and composite numbers. 5.2 Explain why computers use binary system.

	5.3 Convert numbers from one base to another base. 5.4 Perform arithmetic in number bases.
6. Explain and use set theory and notation	6.1 Explain memberships of sets. 6.2 Use proper notation to perform operations of union, intersection, and complement on sets. 6.3 Draw and interpret Venn diagrams of set relations and operations.
7. Identify and use common data structures	7.1 Explain and use arrays. 7.2 Explain and use common structures such as lists, queues and stacks.
8. Explain and use common algorithms	8.1 Explain and use common algorithms for searching & sorting 8.2 Explain the efficiency criteria used to evaluate such algorithms.
9. Understand the fundamental concepts on statistics	9.1 Explain the meaning of key statistical measures 9.2 Distinguish between descriptive statistics and inferential statistics 9.3 Calculate and use descriptive statistics.

Syllabus			
Topic No	Title	Proportion	Content
1	Computational Thinking	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Introduction to the unit • Introduction to the software development process • Solving Problems in Computing • Modelling, diagrams and pseudocode • Definition and design of simple algorithms • Using abstraction and decomposition when attacking a large complex task. Separation of concerns. <p>Learning Outcome: 1</p>

2	Number Systems	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Number and its types: whole numbers, integers, fractions, relational numbers, real numbers, prime numbers and composite numbers • Types of number systems: Decimal, Binary, Octal, and Hexadecimal • Decimal to Binary, Decimal to Octal, and Decimal to Hexadecimal conversion. • Binary to Decimal, Binary to Hexadecimal, and Binary to Octal conversion • Octal to Decimal, Octal to Binary, and Octal to Hexadecimal conversion • Perform operations in different bases <p>Learning Outcomes: 5</p>
3	Boolean Algebra and Propositional Logic 1	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Logic and Boolean algebra, use in computer science and AI. • Statements • Truth Tables • Boolean expressions, Logic • Boolean operators, their precedence: conjunction, disjunction, negation, conditional, and biconditional <p>Learning Outcomes: 2,3</p>
4	Boolean Algebra and Propositional Logic 2	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Propositions and Truth Tables • Tautology, Contradiction, Principle of substitution • Syllogism, logical equivalence • Limitations of propositional logic <p>Learning Outcomes: 2,3</p>
5	Predicate Logic and Set Theory	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Predicates logic and Quantifiers • Predicates logic in Artificial Intelligence • Proofs in Predicate Logic • Predicate logic better than propositional logic? • The notation of set theory • Set operations of union, intersection, complementation, difference, and Cartesian product • Venn diagrams <p>Learning Outcomes: 4, 6</p>
6	Statistics	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Basic terminologies and types of statistics • Measure of Central Tendency • Measure of Dispersion • Statistical data and representation of data <p>Learning Outcomes: 9</p>

7	Introduction to Data Structures 1	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • What is a Data Structure? • Types of data structures • Operations on Data Structures • Array • Representation of Array in Memory <p>Learning Outcomes: 7</p>
8	Introduction to Data Structures 2	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Stack • Queue • Linked List <p>Learning Outcome: 7</p>
9	Searching and Sorting 1	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Big O Notation – Measure of how an algorithm will scale. • Linear search algorithms – Simplest of the searches, to search through every element in an array in order for a search term • Binary search algorithms – To partition a search for increased efficiency. An array in ascending or descending order can be subjected to binary searches <p>Learning Outcomes: 8</p>
10	Searching and Sorting 2	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Bubble Sort Algorithm – A sort which works by repeatedly swapping adjacent elements until an array is ordered. • Quick Sort – More efficient form of sorting, splits arrays and sorts individually • Recursion - A loop that is created by having a function call itself with a smaller set of data. <p>Learning Outcomes: 8</p>

11	Tree Data Structure and Searching Algorithms	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • What is Tree Data Structure? • Types of Tree • Binary Tree • Algorithms to traverse Tree data structure • Binary Search Tree • Searching through BST • Constructing a binary search tree • Introduction to Tries Data Structure • Characteristics and Applications • Types of Tries • Standard • Compress • Suffix • Implementation of Trie Data Structure in Memory <p>Learning Outcomes: 7, 8</p>
12	Unit Summary	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Summary of Topic 1 -11 <p>Learning Outcomes: All</p>

Related National Occupational Standards (NOS)

Sector Subject Area: IT Users

Related NOS: TECHDUDA3, TECHDUDL1

Assessments

60% Global Assignment, 40% Exam

2. Computer Networks

Title	Computer Networks
Unit reference number	M/502/8332
Credits	15
Level	4
Type	Core

Guided Learning Hours	63 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Understand network and communication protocols	1.1 Describe the purpose and development of computer networks 1.2 Explain the overarching principles of the OSI seven-layer model 1.3 Explain the function of each layer of the OSI model, and the protocols associated with it. 1.4 Explain the function and application of a range of communication and network protocols. 1.5 Evaluate the use of various protocols against real-world purposes. 1.6 Explain the function and rationale of wireless networking standards 1.7 Explain a range of contemporary wireless standards and their relevant applications. 1.8 Explain and calculate IPv4 addresses and divide into subnets for a well-defined scenario. 1.9 Describe the Internet architecture, including an overview of routing and DNS
2. Understand the principles of common network topologies and architectures	2.1 Explain the concept of network topology and its design. 2.2 Discuss various common network topologies and their application(s). 2.3 Propose a simple network topology in response to detailed requirements.
3. Understand the application of network security measures	3.1 Install and configure a firewall on an internet-connected system 3.2 Install and configure essential software security measures
4. Be able to select and configure the hardware components of a	4.1 Categorise network cables and connectors and their implementations 4.2 Select the hardware component of a network

computer network to meet the requirements of a precise specification	<p>4.3 Assemble the necessary hardware components to create a network according to a design specification</p> <p>4.4 Configure the hardware components for a wireless network</p> <p>4.5 Test the connectivity of a network</p> <p>4.6 Troubleshoot client-side connectivity issues using appropriate tools</p>
5. Be able to design and install network and server operating systems to meet the requirements of a precise specification	<p>5.1 Identify the software requirements for a computer network</p> <p>5.2 Install and run appropriate network software according to a design specification.</p> <p>5.3 Install and run software components for a wireless network.</p> <p>5.4 Test the correct operation of network and server software</p>
6. Be able to define and configure internet telephony and communication systems	<p>6.1 Identify VOIP components and protocols</p> <p>6.2 Configure Voice over IP (VoIP) system</p> <p>6.3 Explain SIP protocol and how it works</p> <p>6.4 Explain VPN and VPN protocols</p> <p>6.5 Set up and configure a Virtual Private Network (VPN)</p>

Syllabus			
Topic No	Title	Proportion	Content
1.	Introduction to the Unit and Computer Networks	<p>1/12</p> <p>3 hours of lectures</p> <p>1 hour of tutorials</p> <p>1 hour of laboratory</p>	<ul style="list-style-type: none"> • Introduction to Unit • What is a network? Purpose, benefits, resource implications, communications (e.g. transmission mediums), working practice, commercial opportunity, information sharing, collaboration. • Real world networks - Impact of networks on daily lives, the basic requirements of a reliable network and network trends. • The OSI seven-layer model - overarching principles of the OSI seven-layer model <p>Learning Outcome: 1</p>

2	Network Protocols and Standards	1/12 4 hours of lectures 1 hour of tutorials 1 hour of laboratory	<ul style="list-style-type: none"> • Communications and network protocols - Purpose of protocols; adherence, routed protocols IPv4 & IPv6, ICMP, FTP, HTTP, SMTP. • Protocols and the OSI model • Protocols in real world networks • The Internet <p>Learning Outcome: 1</p>
3	Wireless Networking Standards	1/12 4 hours of lectures 1 hour of tutorials 1 hour of laboratory	<ul style="list-style-type: none"> • Wireless devices - Establishing network connections including wired/wireless client configuration. • Wireless networking standards – IEEE 802.11 Wireless Standards • Issues for wireless networks • Wireless networking protocols - Wireless Equivalent Protection (WEP) or WPA (Wi-Fi Protected Access) <p>Learning Outcome: 1</p>
4	Network Hardware	1/12 2 hours of lectures 1 hour of tutorials 2 hours of laboratory	<ul style="list-style-type: none"> • Network hardware - Servers; hub, routers; switches; firewall • Data Link layer, Ethernet frame structure • Network layer, IP addressing • Hardware selection – network card, cabling; permissions; system bus; local-system architecture e.g. memory, processor, I/O devices • Creating a network - supporting infrastructure needs and supporting connectivity requirements <p>Learning Outcome: 4</p>
5	Network Media and Connectors	3 hours of lectures 1 hour of tutorials 2 hours of laboratory	<ul style="list-style-type: none"> • Introduction to Physical layer • Network media - coaxial cable, twisted pair, wireless and fibre optic cable. • Network connectors • Selecting media and connectors <p>Learning Outcome: 4</p>
6	Wireless Network Hardware	2 hours of lectures 1 hour of tutorials 2 hours of laboratory	<ul style="list-style-type: none"> • Wireless network hardware - wireless devices; access point (wireless/wired), content filter, Load balancer, Modem, Packet shaper, VPN concentrator. • Wireless hardware selection • Creating a wireless network <p>Learning Outcome: 4</p>

7	Network Topology and Architecture	3 hours of lectures 1 hour of tutorials 2 hours of laboratory	<ul style="list-style-type: none"> • Network topology concepts – Network representation: logical & physical • Common network topologies and their application: Ethernet, Star, Ring, Bus, Mesh • Dial up, DSL, Fibre to the Home, Wireless networks • Home network components • Transmission of bits in memory <p>Learning Outcome: 2</p>
8	Security Software	3 hours of lectures 1 hour of tutorials 2 hours of laboratory	<ul style="list-style-type: none"> • Network security threats - unauthorised use of a system; unauthorised removal or copying of data or code from a system; damage to or destruction of physical systems, data or code • Security countermeasures – logs, traces, honeypots, data mining algorithms, vulnerability testing. • Security software – Firewalls, Routers, Switches, Gateways • Installing and configuring security software – Configure Network Security measures such as Firewalls, Routers, Switches, Gateways, SSL, IPSec, HTTPs, FTPs, passwords and backup devices. <p>Learning Outcome: 3</p>
9	Firewalls	3 hours of lectures 1 hour of tutorials 1 hour of laboratory	<ul style="list-style-type: none"> • Functions of a firewall - Packet level filtering, Circuit level filtering, Application-level filtering, • Types of firewalls – Hardware and Software • Installing and configuring a firewall <p>Learning Outcome: 3</p>
10	Network and Server Software	2 hours of lectures 1 hour of tutorials 2 hours of laboratory	<ul style="list-style-type: none"> • Network software requirements - Client software, server software, client operating system, server operating system. • Wireless network software requirements • Configuring network software <p>Learning Outcome: 5</p>
11	Voice over IP and Video Conferencing	2 hours of lectures 1 hour of tutorials 1 hour of laboratory	<ul style="list-style-type: none"> • Voice over IP (VoIP) • Video conferencing • Set up and configuring voice networks • Set up and configuring video networks • SIP <p>Learning Outcome: 6</p>

12	Virtual Private Networks	2 hours of lectures 1 hour of tutorials 1 hour of laboratory	<ul style="list-style-type: none"> • Virtual private networks (VPN) - Explaining Virtual Private Network (VPN) features and benefits and compare VPN types. • Advantages and disadvantages of VPN • Set up and configuring VPN <p>Learning Outcome: 6</p>
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Related National Occupational Standards (NOS)

Sector Subject Area: IT and Telecoms

Related NOS: TECIS1101306, TECIS503301, TECIS503302, TECIS503304

Assessments

60% Global Assignment, 40% Exam

3. Computer Systems

Title	Computer Systems
Unit reference number	L/601/0446
Credits	15
Level	4
Type	Core

Guided Learning Hours	56	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Understand and identify the main types and components of computer systems	1.1 Describe main types of computer systems 1.2 Describe the components of modern computer hardware 1.3 Describe the components of modern computer software 1.4 Explain the interaction between the hardware and software in computer systems
2. Describe the structure and role of modern operating systems	2.1 Describe the main components of an operating system 2.2 Explain the main functions of a modern multi-tasking operating system 2.3 Explain the interaction between the operating system and hardware
3. Understand and work with binary numbers and computer logic	3.1 Perform operations on binary numbers 3.2 Explain alternative numbering systems (BCD and ASCII) 3.3 Understand and work with truth-tables and the associated digital logic circuits.
4. Understand the essential structure of computer programs	4.1 Explain instruction sets and addressing modes. 4.2 Explain hardware features designed to support execution of computer programs. 4.3 Explain instruction processing (fetch, decode, execute cycle) 4.4 Explain the interrupt mechanism.
5. Explain the hierarchy of computer software	5.1 Describe system software's role in modern computer systems. 5.2 Compare and contrast functions of compilers and interpreters.

6. Describe alternative computer systems	6.1 Describe essentials of embedded, distributed, multi-core and quantum computing systems 6.2 Explain factors affecting performance of alternative systems. 6.3 Discuss relative benefits of alternative systems
7. Discuss the role of Data Communications and Networks in computer systems	7.1 Identify the main goals of data communications 7.2 Explain how the main goals can be achieved 7.3 Explain the purpose of networking protocols 7.4 Describe different modes of communications 7.5 Describe different network topologies 7.6 List the relative merits of different topologies 7.7 Describe methods of multiple access to LAN

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction	1/12 2 hours of lectures 2 hours of laboratory	<ul style="list-style-type: none"> • Learn What this unit is about: An overview • Why study computer systems. • Assessments • Module delivery • Historical perspective <p>Learning Outcome: 1</p>
2	Computer Systems	1/12 2 hours of lectures 2 hours of laboratory	<ul style="list-style-type: none"> • Distinction between hardware and software • Main classes of computer systems • Types of digital computers • The digital computer – hardware and software models <p>Learning Outcome: 1, 6</p>
3	Computer systems hardware	1/12 2 hours of lectures 2 hours of laboratory	<ul style="list-style-type: none"> • Memory • CPU components (ALU, control unit, cache) • Computer buses • The digital computer – software/hardware model • RISC and CISC architectures <p>Learning Outcome: 1</p>

4	Operating systems 1	1/12 2 hours of lectures 2 hours of laboratory	<ul style="list-style-type: none"> • What is an operating system? <ul style="list-style-type: none"> ○ Why needed. ○ What they do. ○ How they function. • A brief history of operating systems <p>Learning Outcome: 2</p>
5	Operating systems 2	1/12 2 hours of lectures 2 hours of laboratory	<ul style="list-style-type: none"> • A generalised model of OS • Managing computer systems resources • Functions of a typical modern OS • Types and examples of OS • Virtual machines • Working with OS (users' and programmers' points of view) <p>Learning Outcome: 2</p>
6	Numbers and logic	1/12 2 hours of lectures 2 hours of laboratory	<ul style="list-style-type: none"> • Understanding binary numbers • Operations on binary numbers • 2's complement format • Octal and Hexadecimal numbers • Binary coded decimal (BCD) • ASCII character set • Negative numbers • Logic and truth tables <p>Learning Outcome: 3</p>
7	Computer programs	1/12 2 hours of lectures 2 hours of tutorials 2 hours of laboratory sessions	<ul style="list-style-type: none"> • Programmer's point of view • Instruction-sets (RISC vs CISC ISA) • Hardware registers • Addressing modes • Input and output • Context switching • Interrupts <p>Learning Outcome: 4</p>
8	Computer systems software	1/12 2 hours of lectures 2 hours of tutorials 2 hours of laboratory sessions	<ul style="list-style-type: none"> • Software hierarchy • Systems software • Interpreters • Compilers • Databases • Networking software • Program development environments • Operating systems <p>Learning Outcome: 5</p>

9	Digital logic	1/12 2 hours of lectures 2 hours of tutorials 2 hours of laboratory	<ul style="list-style-type: none"> • Executing instructions (fetch, decode execute) • Logic gates • From logic equations to logic circuits (some examples) • Realising digital circuits (some examples) • Logic design and simulation tools <p>Learning Outcome: 3</p>
10	Embedded systems	1/12 2 hours of lectures 2 hours of tutorials 2 hours of laboratory sessions	<ul style="list-style-type: none"> • CPU and flash memory • RAM • Programmable input/output • Internal peripherals • Examples (input/output interfaces) • Embedded systems software <p>Learning Outcome: 1, 6</p>
11	Computer networks	1/12 2 hours of lectures 2 hours of laboratory sessions	<ul style="list-style-type: none"> • Elements of communications • Transmission media • Communications protocols and standards • Network topologies • Networking components (hubs, switches, routers) • LAN, MAN, WAN <p>Learning Outcome: 7</p>
12	Advanced topics	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Speeding up computer systems <ul style="list-style-type: none"> ○ Pipelines ○ Caches ○ Compiler optimisations • Distributed computer systems • Multi-core computer systems • Quantum computers <p>Learning Outcome: 1, 6</p>

Related National Occupational Standards (NOS)
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Sector Subject Area: IT Users

Related NOS: TECHDUDL1, TECHDUDW1, TECHDUOS1, ESKITU010, ESKITU011

Assessments

60% Global Assignment

40% Global Exam

4. Databases

Title	Databases
Unit reference number	T/502/8333
Credits	15
Level	4
Type	Core

Guided Learning Hours	48 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Understand the concepts associated with database systems	1.1 Summarise the common uses of database systems 1.2 Explain the meaning of the term database 1.3 Explain the meaning of the term database management system (DBMS) 1.4 Describe the components of the DBMS environment 1.5 Describe the typical functions of a DBMS 1.6 Summarise the advantages and disadvantages of a DBMS 1.7 Define the term security and describe examples of threats, and vulnerabilities that can compromise database security, together with their impact. 1.8 Explain strategies to control database security risks.
2. Understand the concepts associated with the relational model	2.1 Summarise the concept of the relational model. 2.2 Explain the terminology associated with the relational model 2.3 Explain the concept of relational integrity.
3. Understand how to design and develop a database system	3.1 Explain the goal of Entity Relationship (ER) modelling 3.2 Draw an ER diagram (ERD) using UML 3.3 Explain the concepts of an entity type, relationship and attribute 3.4 Interpret an ERD 3.5 Construct an ERD from a scenario. 3.6 Explain the purpose of primary and foreign keys 3.7 Recognise strong and weak entities 3.8 Identify and explain ways of solving problems in ER models

4. Be able to develop and enhance a logical database design	4.1 Explain the process of requirements gathering 4.2 Design a set of database tables from an entity model 4.3 Document the tables, columns and domains in a database using a data dictionary 4.4 Describe the features and use of CASE tools 4.5 Describe the concept of functional dependency 4.6 Recognise anomalies in relations 4.7 Explain and apply the normalisation process to produce a model in 3NF 4.8 Define the term Transaction . 4.9 Construct a CRUD matrix to analyse a transaction. 4.10 Recognise potential performance issues 4.11 Identify the potential need for denormalisation
5. Be able to develop and enhance a database system using SQL	5.1 Explain the purpose of SQL 5.2 Create database tables based on a data dictionary 5.3 Use DDL commands to create, delete and modify a database 5.4 Explain and define integrity constraints on tables 5.5 Retrieve, Insert, update and delete table data 5.6 Retrieve data from one or more tables using join 5.7 Retrieve data from one or more tables using sub-queries
6. Understand the principles behind Big Data and the NoSQL databases	6.1 Explain the limitations of relational databases 6.2 Explain the key features of Big Data 6.3 Outline basic techniques for handling Big Data 6.4 Describe the four main types of NoSQL data models including document, key-value pair, wide column, and graph
7. Understand the concepts and principles of Cloud database	7.1 Describe the characteristics of cloud databases 7.2 Explain the benefits of cloud database solutions

Syllabus Content		
Topic	Proportion	Course coverage
1. Introduction to the Unit and Database Fundamentals	1/12 2 hours of lectures 1 hour of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • Introduction to the unit • What are databases? • Data and information • Pre-database information systems • Database approach • Database management systems • The relational model and alternatives <p>Learning Outcome: 1</p>

2. Entity Relationship (ER) Modelling (1)	1/12 2 hours of lectures 1 hour of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • Entity Relationship Modelling • Types of Notation • Basic concepts <ul style="list-style-type: none"> • Entities • Relationships • Attributes • Identifying Entities <p>Learning Outcome: 3</p>
3. Entity Relationship (ER) Modelling (2)	1/12 2 hours of lectures 1 hour of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • Constructing ER models • Identifying Entities • Primary and Foreign keys • Strong and weak entities • Identifying problems in ER models • Problem solving in ER models <p>Learning Outcome: 3</p>
4. The Relational Model	1/12 2 hours of lectures 1 hour of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • Aims of the relational model • Basic concepts of the relational model • Terminology <p>Learning Outcome: 2</p>
5. Normalisation	1/12 2 hours of lectures 1 hour of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • Relational integrity • Anomalies • Functional dependency • The process of normalisation <p>Learning Outcomes: 2,4</p>
6. SQL	1/12 2 hours of lectures 2 hours of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • Purpose of SQL • Basic concepts of SQL • Datatypes in SQL • Creating tables • More on the select statement • Fixing errors and optimisation. <p>Learning Outcome: 2,5</p>

7. Database Design	1/12 2 hours of lectures 2 hours of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • Understanding requirements • Identifying a set of tables from an ER model • The data dictionary • Use of CASE tools <p>Learning outcome: 4</p>
8. Supporting Transactions	1/12 2 hours of lectures 2 hours of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • Business rules • Identifying and documenting transactions <ul style="list-style-type: none"> • ACID Criteria • CRUD analysis • Views and de-normalisation <p>Learning Outcome: 4</p>
9. Database Implementation	1/12 2 hours of lectures 1 hour of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • The implementation environment • Creating tables • Enforcing integrity via constraints • Creating indexes • Inserting data at implementation • Oracle as an example implementation environment <p>Learning Outcome: 5</p>
10. Database Security and Cloud Databases	1/12 2 hours of lectures 1 hour of laboratory 1 hour of tutorials	<ul style="list-style-type: none"> • Concepts of database security • Database security measures • Concepts of cloud databases • Advantages of cloud databases • Explore cloud database providers • Case studies <p>Learning Outcome: 1,7</p>
11. Big Data and Post-Relational databases	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • The limitations of the relational model • Introduction to Big Data • 3V model • NoSQL <ul style="list-style-type: none"> • key-value pair, document, graph, wide column • Techniques for handling Big Data <ul style="list-style-type: none"> • Hadoop, Spark <p>Learning Outcome: 6</p>

12. Summary	1/12 2 hours of lectures	<ul style="list-style-type: none"> • Summary of unit • Identifying links with other units/subject areas • Clarification of unit material and related issues as identified by students <p><i>Learning Outcomes: ALL</i></p>
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Related National Occupational Standards (NOS)
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Sector Subject Area: IT and Telecoms

Related NOS: ESKITP4023, ESKITP4023, ESKITP4053, ESKITP4053, ESKITP4053, ESKITP4053
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Assessments

60% Global Assignment

40% Global Exam

5. Designing and Developing Object-Oriented Computer Programs

Title	Designing and Developing Object-Oriented Computer Programs
Unit reference number	T/601/3308
Credits	15
Level	4
Type	Specialist/Elective

Guided Learning Hours	84 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Design object-oriented programmes to address loosely-defined problems	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.
2. Implement object-oriented programmes from well-defined specifications	2.1 Produce a working programme which satisfies the design specification 2.2 Make effective use of basic programming language features and programming concepts to implement a programme that satisfies the design specification 2.3 Make effective use of the features of the programming environment 2.4 Make effective use of user interface components in the implementation of the programme 2.5 Make effective use of a range of debugging tools
3. Develop object-oriented programs that reflect established programming and software engineering practice	3.1 Apply standard naming, layout and comment conventions 3.2 Apply appropriate data validation and error handling techniques
4. Develop test strategies and apply these to object-oriented programmes	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 programme
5. Develop design documentation for use in program maintenance and end-user documentation	5.1 Record the final state of the programme in a form suitable for subsequent maintenance 5.2 Provide end-user documentation that meets the user's needs

Syllabus			
Topic	Title	Proportion	Content
1	An Introduction to the .NET framework	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> Visual Studio IDE The Design of .NET programs Sequential Program Flow <p>Learning Outcomes: 2 & 3</p>
2	Event Driven Programming	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> Event Handling Mouse Events Paper Prototypes Wizard of Oz <p>Learning Outcomes: 2, 3, & 5</p>
3	Programming Structures (1)	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> Selections within .NET Branching Program Flow <p>Learning Outcomes: 2 & 3</p>
4	Programming Structures (2)	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> Repetition within .NET Iterative Program Flow <p>Learning Outcomes: 2 & 3</p>
5	Object Orientation (1)	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> Classes Objects Encapsulation Abstraction <p>Learning Outcomes: 1, 2 & 3</p>

6	Consolidation (1)	1/12 8 hours of laboratory sessions	<ul style="list-style-type: none"> Worked example of material to date <p>Learning Outcomes: 1, 2, 3 & 5</p>
7	Data Structures	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> Arrays ArrayLists Dictionary Generics <p>Learning Outcomes: 1, 2 & 3</p>
8	Object Orientation (2)	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> Inheritance Polymorphism Introduction to UML Coupling and Cohesion <p>Learning Outcomes: 1, 2, 3, 4 & 5</p>
9	Consolidation (2)	1/12 6 hours of laboratory sessions	<ul style="list-style-type: none"> Worked example of material to date <p>Learning Outcomes: 1, 2, 3 & 5</p>
10	Testing and Error Handling	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> Testing strategies Regression testing Detection and correction of errors Exception handling <p>Learning Outcomes: 4 & 5</p>
11	File IO	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> File IO Serialization <p>Learning Outcomes: 2, 3, & 4</p>
12	Databases with .NET	1/12 1 hour of lectures 6 hours of laboratory sessions	<ul style="list-style-type: none"> Connection to databases Querying data Representing Data <p>Learning Outcomes: 2, 3, 4 & 5</p>

Related National Occupational Standards (NOS)
Sector Subject Area: IT and Telecoms Related NOS: ESKITP5013, ESKITP5014v2, ESKITP5024, ESKITP5034

Assessments
Global Assignment (100%)

6. Front-End Web Development

Title	Front-End Web Development
Unit reference number	R/651/1146
Credits	15
Level	4
Type	Core

Guided Learning Hours	72 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Describe the concepts of website development and underlying technologies, key concepts and tools and technologies necessary for front-end development	1.1 Describe the underlying technologies for building websites 1.2 Explain fundamental concepts of website design including the client-server model 1.3 Distinguish between front-end web development and back-end web development 1.4 Identify key concepts and technologies needed for front-end web development
2. Use web development tools to build HTML- and CSS-based websites with a range of CSS frameworks to address well-defined specifications	2.1 Describe the use of HTML to develop websites 2.2 Describe how to use CSS to standardise the overall style of a website 2.3 Write the source code for a simple web page in clean HTML according to a specification 2.4 Write the source code for a CSS according to a specification 2.5 Explain the contextual application of a variety of web development tools 2.6 Explain a range of CSS frameworks including Bootstrap, foundation, Semantic UI 2.7 Explain the advantages and disadvantages of various web development methodologies and technologies

<p>3. Create and design responsive website to scale well across laptop, tablet and mobile phone</p>	<p>3.1 Use Bootstrap concepts and develop responsive web pages 3.2 Use CSS3 layout model: Flexbox for responsive and mobile-friendly design 3.3 Explain the difference between CSS Grid Layout and CSS Flexbox Layout</p>
<p>4. Build interactive webpages and dynamic webpages using JavaScript and associated libraries</p>	<p>4.1 Write and apply JavaScript programming skills for building dynamic and interactive sites 4.2 Explain DOM concepts 4.3 Effectively use frameworks and libraries for Javascript 4.4 Create animated, interactive web pages using jQuery library 4.5 Build data visualisation webpages using d3.js library.</p>
<p>5. Understand and be proficient with front end development frameworks</p>	<p>5.1 Develop front-end application by using Bootstrap architecture, services, and concepts 5.2 Explain the advantages and disadvantages of using frameworks 5.3 Employ JavaScript libraries to build dynamic, interactive, informative websites</p>
<p>6. Understand and use a version control system (VCS) for project collaboration with other developers and explain the process of deploying websites on servers.</p>	<p>6.1 Explain the concepts of Version Control and its significance 6.2 Track changes and collaboration with GitHub 6.3 Explain the flow of GitHub</p>
<p>7. Develop appropriate test strategies and apply these to a website.</p>	<p>7.1 Develop and apply a test strategy consistent with the design 7.2 Develop Cross Browser Compatibility Testing</p>

Syllabus			
Topic No	Title	Proportion	Content
1	Overview of Web Application Architecture	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> • What is Web application architecture? • How does the Web application architecture work? • 3-Tier architecture • Layers of Modern Web Application Architecture: Presentation Layer, Application Layer, and Data Layer • Web application architecture components • Key concepts and technologies for front-end web development <p>Learning Outcomes: 1</p>
2	Introduction to HTML5	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> • What is HTML? • HTML document structure • HTML Tags • Ordered and Unordered Lists • Images • Forms • HTML best practices <p>Learning Outcomes: 2</p>
3	Introduction to CSS	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> • CSS Introduction • CSS backgrounds, borders, margins, padding • CSS Front Styling • Gradients • CSS best practices <p>Learning Outcomes:2</p>
4	HTML and CSS	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> • DIV element • SPAN element • CSS Selectors • Coding with HTML and CSS <p>Learning Outcomes: 2</p>

5	CSS Flexbox and Grid Layout	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> • What is CSS Grid Layout? • Grid container • What is CSS Flexbox? • Flex container and flex items • Differences with Grid and Flexbox <p>Learning Outcomes: 3</p>
6	JavaScript - I	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> • JavaScript's key fundamental features • JavaScript data types and objects <p>Learning Outcomes: 4</p>
7	JavaScript - II	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> • Understanding and working with DOM • DOM Manipulation and Events <p>Learning Outcomes: 4</p>
8	jQuery	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> • About jQuery and how jQuery works • jQuery UI • jQuery Events and Effects <p>Learning Outcomes: 4</p>
9	Responsive CSS Framework: Bootstrap - I	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> • Bootstrap Installation • Bootstrap containers • Spinners, Cards • Responsive grid system <p>Learning Outcomes: 3</p>

10	Responsive CSS Framework: Bootstrap - I	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> Advanced features of Bootstrap for responsive web pages Bootstrap form, form controls, buttons, utilities and Cards Bootstrap elements <p>Learning Outcomes: 5</p>
11	Code Review, Testing and Collaboration	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> Webapp testing SDLC SDLC models Version Control <p>Learning Outcomes:6 and 7</p>
12	Unit Summary	1/12 2 hours of lectures 4 hours of laboratory sessions	<ul style="list-style-type: none"> Summary and recap of previous units <p>Learning Outcomes: All</p>

Related National Occupational Standards (NOS)

Sector Subject Area: IT Users

Related NOS: TECHDUDC2, TECHDUDC3, TECHDUDM1

Assessments

100% Assignment

7. Object-Oriented System Analysis and Design

Title	Object-Oriented System Analysis and Design
Unit reference number	T/651/1147
Credits	15
Level	4
Type	Specialist

Guided Learning Hours	60 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Discuss various approaches to systems analysis and design and explain their strengths and weaknesses	1.1 Explain the role of systems analysis and design in the Software development lifecycle. 1.2 Describe the role of business analysts, system analysts and system architects. 1.3 Describe, in outline, the key features of various approaches to systems analysis, together with their relative advantages.
2. Apply object-oriented techniques for systems analysis and modelling of well defined but complex problems	2.1 Explain the key principles of object-oriented analysis and design. 2.2 Discuss stakeholder communication and knowledge elicitation techniques
3. Explain and use UML to represent object-oriented models	3.1 Explain the purpose and scope of UML. 3.2 Use UML to represent Use Case diagrams. 3.3 Use UML to represent Class diagrams. 3.4 Use UML to represent Sequence diagrams. 3.5 Use UML to represent Activity diagrams. 3.6 Use UML to represent State diagrams. 3.7 Review the effectiveness and appropriateness of methods, actions and results. 3.8 Use software tools to create appropriate Object-Oriented models.
4. Understand the integration between the design models and implementation	4.1 Explain and use architecture diagrams, design patterns and libraries. 4.2 Discuss how design models can be implemented. 4.3 Explain how traceability is ensured.

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction to Systems Analysis and Design	1/12 2 hours of lectures 3 hours of tutorials	<ul style="list-style-type: none"> • An introduction to the Unit. • Information Systems: Definition, types, examples. • Information systems analysis in the context of the Software Development LifeCycle (SDLC). • Analysis and requirements capture. • Role of analysis and requirements capture in specific contexts. • Role of business analysts, system analysts and system architects. • Relationship to software engineering & quality management. • The Agile Manifesto • Key stakeholders, accountabilities and responsibilities; power-interest dynamics. <p>Learning Outcomes: 1</p>
2	Requirements Elicitation	1/12 2 hours of lectures 3 hours of tutorials	<ul style="list-style-type: none"> • Current system analysis • Requirements gathering techniques and sources of information <ul style="list-style-type: none"> – User based requirements gathering: Interviews, surveys, questionnaires, focus groups – Analytical requirements gathering: document analysis, bench marking, prototyping • Requirements specification • Prioritization of requirements (cost, timescale) • Categorisation of requirements: Operational, Functional, non-functional including quality and standards • Stakeholder analysis and responsibility assignment (e.g using RACI matrix) • Business case and feasibility studies <p>Learning Outcomes: 1</p>
3	Introduction to OOAD	1/12 2 hours of lectures 3 hours of tutorials	<ul style="list-style-type: none"> • Overview of object-oriented approach including differentiation of Object-based design vs object-orientation • OO concepts: Objects, classes, Abstraction, Encapsulation, Interfaces, Inheritance, Polymorphism, messages <p>Learning Outcomes: 2</p>

4	OO methods and methodologies Use Case Modelling	1/12 2 hours of lectures 1 hour of tutorial 2 hours lab	<ul style="list-style-type: none"> • History of OO, OO methods and methodologies with a focus on UML • Use Case modelling, an OO requirements modelling approach • UML CASE tools <p>Learning Outcomes: 2, 3</p>
5	Class Diagrams	1/12 2 hours of lectures 1 hour of tutorial 2 hours lab	<ul style="list-style-type: none"> • Static Modelling • Classes and relationships <ul style="list-style-type: none"> - Inheritance: Generalisation/Specification - Associations, aggregation, composition - Multiplicities • The development of simple class diagrams. • The role of 'class diagrams' in analysis and design models • Modelling with UML CASE tool • Case study and examples <p>Learning Outcomes: 3</p>
6	Behavioural/ Interaction Models	1/12 2 hours of lectures 1 hour of tutorial 2 hours lab	<ul style="list-style-type: none"> • State Transition Modelling with Statecharts • Activity diagrams • Modelling with UML CASE tool <p>Learning Outcomes: 3</p>
7	More on Interaction Diagrams	1/12 2 hours of lectures 1 hour tutorial 2 hours lab	<ul style="list-style-type: none"> • Collaboration Diagram • Communication Diagrams • Sequence Diagrams • Relationship with other models <p>Learning Outcomes: 3</p>
8	Case Study	1/12 5 hours tutorial	<ul style="list-style-type: none"> • Student led presentations of worked example (group work) followed by tutor led mock answer <p>Learning Outcomes: 3,</p>

9	Complementary OO Methods	1/12 2 hours of lectures 1 hour of tutorial 2 hours lab	<ul style="list-style-type: none"> • CRC Cards • OCL (Object Constraint Language) <p>Learning Outcomes: 3</p>
10	OO Design	1/12 2 hours of lectures 3 hours of tutorials	<ul style="list-style-type: none"> • From Analysis to Design <ul style="list-style-type: none"> - System Architecture - Design Patterns - Design models - Interfaces - Packaging classes - Implementation • Design Optimisation • Traceability • Estimation <p>Learning Outcomes: 1,3,4</p>
11	Quality Management	1/12 2 hours of lectures 3 hours of tutorials	<ul style="list-style-type: none"> • Quality assurance: verification, validation, testing • Software development standards: Sources and general purposes and uses <p>Learning Outcomes: 1</p>
12	Unit Summary	1/12 2 hours of lectures 3 hours of tutorials	<ul style="list-style-type: none"> • Systems Analysis and Design role in Software Development • SAD paradigms • OOSAD key concepts • OOSAD key models • Relative advantages and disadvantages <p>Learning Outcomes: All</p>

Related National Occupational Standards (NOS)

Sector Subject Area: ICT Users

Related NOS: ESKITU011, ESKITU010, ESKITU012, ESKITU020

Assessments

60% Global Assignment

40% Exam

8. Software Engineering

Title	Software Engineering
Unit reference number	Y/651/1148
Credits	15
Level	4
Type	Specialist/Elective

Guided Learning Hours	48 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Explain the need for an engineering approach to software development	1.1 Discuss the nature of Software 1.2 Explain the motivation for the development of software engineering 1.3 Describe the cost of software maintenance 1.4 Explain software quality (code, quality, security) 1.5 Explain Software Engineering 1.6 Discuss software engineering ethics
2. Explain software engineering key practices and principles	2.1 Describe the software product lifecycle and SDLC models 2.2 Explain why alternative software development lifecycles have been developed. 2.3 Discuss the role of requirements engineering, system modelling, testing, maintenance, reuse, project management, cyber security in software engineering. 2.4 Explain software engineering design principles 2.5 Discuss approaches to secure software development models
3. Create models of software data and processes using object oriented modelling approaches	3.1 Explain the purpose and range of modelling to produce quality software. 3.2 Create appropriate UML models for a well-defined scenario of limited scope. 3.3 Explain how the models embody the principles of good practice in software engineering.
4. Describe and evaluate tools and techniques to enhance productivity and quality of software	4.1 Explain Object Oriented programming 4.2 Describe project management tools and methods for ensuring software quality (Planning, monitoring, control, risk, quality, organisation) 4.3 Explain risk assessment and control 4.4 Explain methods and techniques for software testing and change management (quality, monitoring & control) 4.5 Discuss the role of documentation in software engineering (Risk register, Gantt chart etc)

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction to Software Engineering Module	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> Defining Software and its unique characteristics. Software application domains The Software crisis and issues in software development Software maintenance: types, costs ISO/IEC 14764 Definition of software quality Factors contributing to measures of software quality Software engineering ethics <p>Learning Outcomes: 1</p>
2	Introduction to Software Engineering Key Practices and Principles	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> Software product lifecycle and SDLC models Teamwork Project management, productivity Requirements engineering System Design, modelling, reuse Testing Configuration management Maintenance Software reuse Object-oriented programming Discuss approaches to secure software development models <p>Learning Outcomes: 2</p>
3	Software Development Life Cycle Models	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> Software process models Waterfall model Incremental model Agile development Criteria to select SDLC model appropriate to each type of project. Coping with change Process improvement <p>Learning Outcomes: 2,3</p>

4	Requirements Engineering	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Functional and Non-Functional Requirements (different types of requirements) • Requirements engineering processes • Requirements elicitation & Analysis • Requirements specification • Requirements validation & Management • Requirements change <p>Learning Outcomes: 2</p>
5	System Modelling and Design	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Design principles: Separation of concerns, Encapsulation & Abstraction • Component based software engineering • UML modelling: interaction, structural and behavioural models • Use Cases, Class diagrams, object diagrams, activity diagrams, sequence diagrams. • Patterns and architecture. <p>Learning Outcomes: 2,3</p>
6	Software Implementation & Testing	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Implementation issues: reuse, configuration management, open-source development • Validation, Verification and Testing • Development testing • Test driven development • Test Techniques • Release testing • User Testing • Traceability • Software evolution <p>Learning Outcomes: 2,4</p>

7	System Dependability and Security	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Security defined: dependable systems • Secure software development models • Threat modelling • Code security • Software quality assurance • Software security testing • Reliability engineering: availability and reliability, fault tolerance • Safety Engineering: safety critical systems, formal specifications <p>Learning Outcomes: 2, 3, 4</p>
8	Project Management	1/12 2 hours of lectures 2 hours of tutorials	<ul style="list-style-type: none"> • Project Planning: scheduling, estimating, Gantt charts. • Risk assessment and management • Teamwork • Quality management <p>Learning Outcomes: 4</p>
9	Mini project 1	1/12 1 hour of lectures 3 hours of seminar	<ul style="list-style-type: none"> • Analysis and Planning • Requirements Gathering <p>Learning Outcomes: 2</p>
10	Mini Project 2	1/12 1 hour of lectures 3 hours of seminar	<ul style="list-style-type: none"> • Design and Prototyping • Software Development <p>Learning Outcomes: 3</p>
11	Mini Project 3	1/12 1 hour of lectures 3 hours of seminar	<ul style="list-style-type: none"> • Testing and Deployment <p>Learning Outcomes: 4</p>
12	Mini Project 4	1/12 1 hour of lectures 3 hours of seminar	<ul style="list-style-type: none"> • Project Presentation and Demonstration <p>Learning Outcomes: All</p>

Related National Occupational Standards (NOS)
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Sector Subject Area: IT and Telecoms

Related NOS: ESKITU020, ESKITU021, ESKITU041

Assessments

100% (Mini Project + Report)

9. eBusiness

Title	eBusiness
Unit reference number	F/502/8321
Credits	15
Level	4
Type	Mandatory Specialist

Guided Learning Hours	36 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Analyse eCommerce business models	1.1 Identify eCommerce business models. 1.2 Discuss the advantages and disadvantages of eCommerce. 1.3 Compare and contrast different eCommerce revenue models.
2. Analyse eCommerce business-to-consumer strategies	2.1 Explain various eMarketing strategies. 2.2 Discuss Customer Relationship Management (CRM). 2.3 Identify the various forms of online advertising.
3. Analyse eCommerce business-to-business strategies	3.1 Explain the business purchase process using eCommerce technologies 3.2 Assess the use of Electronic Data Interchange (EDI) in eCommerce businesses. 3.3 Discuss the importance of supply chain management in eCommerce businesses
4. Evaluate various forms of online marketplace	4.1 Identify different types and relative effectiveness of online marketplaces 4.2 Compare and contrast different types of online auction. 4.3 Discuss the advantages and disadvantages of forms of online payment.
5. Examine the security threats posed to eCommerce users	5.1 Describe the security threats posed by the use of eCommerce technology for end-users and enterprises. 5.2 Discuss the technology available to combat eCommerce security threats.
6. Understand how to plan eCommerce strategies	6.1 Identify the objectives for an eCommerce strategy. 6.2 Explain the key factors in successfully managing an eCommerce project.

Syllabus			
Topic No	Title	Proportion	Content
1.	Introduction to eCommerce	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Scope of eCommerce • Business models, drivers and identification of opportunities. <p>Learning Outcome: 1</p>
2.	eCommerce Revenue Models	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • A range of eCommerce revenue models, both established and emerging – Research and provide examples of different type <p>Learning Outcome: 4</p>
3.	eMarketing Strategies	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Develop effective web-based marketing strategies and exploit CRM • Research a local eMarketing campaign and identify strengths and weaknesses <p>Learning Outcome: 2</p>
4.	Advertising and Brand Management	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Main options for web-based advertising and importance of effective brand management • Research successful use of search engine positioning and provide examples <p>Learning Outcome: 2</p>
5.	eCommerce Business to Business Strategies	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Use of eCommerce to enhance purchasing and logistics activities, and the role of EDI • Research developments in EDI on the Internet <p>Learning Outcome: 3</p>
6.	Supply Chain Management	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Main elements of supply chain management and the potential efficiencies • Identify key supply chain issues for a large local retailer <p>Learning Outcome: 3</p>

7.	Online Auctions	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Different types of online auctions and applicability in the B2B environment • Identify a local B2B auction and evaluate strengths and weaknesses <p>Learning Outcome: 4</p>
8.	Online Marketplaces, Communities and Portals	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Overview of different approaches to developing online communities and associated revenue models • Research a local web portal and establish the services offered <p>Learning Outcome: 4</p>
9.	Security Threats and Countermeasures for End Users	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Overview of main security threats to PC users and the approaches to countering these • Research the major security threats posed to by worms and Trojan horses <p>Learning Outcome: 5</p>
10.	Security Threats and Countermeasures for Enterprises	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Overview of the main security threats posed to eCommerce servers and the approaches to countering these • Identify three possible threats to an eCommerce server <p>Learning Outcome: 5</p>
11.	Payment Systems for eCommerce	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Main options for providing payment systems for eCommerce systems • Research payment systems used on three eCommerce systems <p>Learning Outcome: 4</p>
12.	Planning for eCommerce	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> • Planning eCommerce implementation • Managing the implementation • Measuring its effectiveness <p>Learning Outcome: 6</p>

Related National Occupational Standards (NOS)
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Sector Subject Area: Management and Leadership National Occupational Standards 2008 Related NOS: CFAMLE4, CFABAA111, ESKIITS1, ESKIITS2, ESKIITS3, CFABAA623

Assessments

Global Assignment (100%)

10. Essentials of Management

Title	Essentials of Management
Unit reference number	F/502/8323
Credits	15
Level	4
Type	Mandatory Special Units

Guided Learning Hours	36 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Analyse the function of management	1.1 Discuss the roles and functions of managers within an organisation. 1.2 Evaluate the key skills needed to be a successful manager.
2. Examine the management decision-making process	2.1 Discuss the importance of the management decision-making process. 2.2 Compare and contrast different decision-making styles.
3. Assess the use of management and organisational strategies	3.1 Discuss the importance of strategic management within an organisation. 3.2 Discuss the different types of corporate and business-level strategies that can be employed.
4. Analyse how management can influence individual and group performance	4.1 Discuss how organisational behaviour can explain, predict and influence individual behaviour. 4.2 Evaluate the ways in which job satisfaction can impact upon employee behaviour. 4.3 Evaluate the major determinants of group performance and satisfaction. 4.4 Evaluate the strengths and weaknesses of contemporary theories of motivation. 4.5 Discuss and explain the key factors in designing motivating jobs.
5. Examine theories of leadership and control	5.1 Discuss the challenges posed to leadership by contemporary business models. 5.2 Assess the importance of control in effective organisational performance.

Topic No	Title	Proportion	Content
1	Introduction to Management	1/12 2 hours of lectures 1 hour of tutorials	Management functions and characteristics of an organisation. Learning Outcome: 1
2	Management Theories	1/12 2 hours of lectures 1 hour of tutorials	Key research and theories in management. Learning Outcome: 1
3	Decision Making	1/12 2 hours of lectures 1 hour of tutorials	The manager as a decision maker. Learning Outcome: 2
4	Planning	1/12 2 hours of lectures 1 hour of tutorials	How and why do managers plan? Learning Outcome: 3
5	Strategic Management	1/12 2 hours of lectures 1 hour of tutorials	Key steps in the strategic management process. Learning Outcome: 3
6	Organisational Strategies	1/12 2 hours of lectures 1 hour of tutorials	Research into types of growth and business level strategies. Learning Outcome: 3
7	Planning Tools and Techniques	1/12 2 hours of lectures 1 hour of tutorials	The key planning tools and techniques for allocating resources and undertaking effective management. Learning Outcome: 5
8	Foundations of Behaviour	1/12 2 hours of lectures 1 hour of tutorials	Research into the individual behaviour of employees and how it can impact upon their work-related performance. Learning Outcome: 4
9	Groups and Teams	1/12 2 hours of lectures 1 hour of tutorials	Group performance and effective teams. Learning Outcome: 4
10	Theories of Motivation	1/12 2 hours of lectures 1 hour of tutorials	Early and contemporary theories of motivation. Learning Outcome: 4
11	Leadership Theories	1/12 2 hours of lectures 1 hour of tutorials	Research into effective leadership. Learning Outcome: 5
12	The Control Process	1/12 2 hours of lectures 1 hour of tutorials	Designing control systems and using tools to control organisational performance. Learning Outcome: 5

Related National Occupational Standards (NOS)
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Sector Subject Area: Business and Administration NOS (2010)
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Related NOS: CFABAG121, CFABAG122.

Assessments

Global Assignment (100%)

11. Understanding Business Organisations

Title	Understanding Business Organisations
Unit reference number	J/502/9275
Credits	15
Level	4
Type	Mandatory Specialist

Guided Learning Hours	36 hours	Total Qualification Time	150 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Evaluate various types of organisations	1.1 Compare and contrast the form, aims, objectives and operations of business organisations across a number of sectors.
2. Evaluate various forms of organisational structure	2.1 Discuss the process of organisational development 2.2 Compare and contrast the mechanistic and organic forms of organisation structure. 2.3 Analyse the competitive forces exerting influences on an organisation and its structure.
3. Examine the process of organisational change	3.1 Compare and contrast types of organisational change. 3.2 Discuss the steps in the change process for organisations. 3.3 Assess the impact of resistance to change on organisational performance.
4. Assess the use of communication in organisations	4.1 Analyse the barriers to effective communication. 4.2 Examine the ways in which communication processes can help or hinder organisational performance.
5. Examine how organisational performance is monitored	5.1 Discuss the control processes put in place in organisations. 5.2 Compare and contrast the use of budgetary and non-budgetary methods of control
6. Evaluate the use of IT systems on the performance and structure of an organisation	6.1 Assess how the effective use of IT can impact upon organisational performance. 6.2 Explain how the Internet and collaboration technologies have enabled new forms of organisation.

Topic No.	Title	Proportion	Content
1	Different Types of Organisation	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> Non-incorporated organisations, limited companies and other business organisations. <p>Learning Outcome: 1</p>
2	Organisational Structures	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> Alternative forms of organisation structure. Review advantages and disadvantages of the main types. <p>Learning Outcome: 1</p>
3	Mechanistic and Organic Forms of Organisational Structure	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> Compare and contrast the features of mechanistic and organic forms of organisational structure. <p>Learning Outcome: 2</p>
4	Human Resource Management	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> The impact of Human Resource Management (HRM) on organisational performance, and the key aspects of HRM. <p>Learning Outcome: 3</p>
5	Organisations and the Competitive Environment	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> The main sets of forces exerting influences on organisations. Tools to analyse the competitive environment. <p>Learning Outcome: 2</p>
6	Change in Organisations	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> The motivations for organisational change, the types of change that can be introduced and the impact of organisational culture on potential change. <p>Learning Outcome: 3</p>
7	Implementing and Managing Organisational Change	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> The steps in the change process, resistance to change and managing change successfully. <p>Learning Outcome: 3</p>

8	Effective Communication in Organisations	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> Different types of communication channels, advantages and disadvantages of each, and selecting the appropriate communication medium. <p>Learning Outcome: 4</p>
9	Monitoring Organisational Performance – Financial & Budgetary Control	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> The importance of financial results and budgetary control in evaluating organisational performance. <p>Learning Outcome: 5</p>
10	Optimising Organisational Performance – Quality and Operational Measures	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> The use of quality control, Total Quality Management (TQM) and operational systems. <p>Learning Outcome: 5</p>
11	The IT Environment Within Business	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> The use of technology within the organisation for enhancing business activities, decision making and operations. <p>Learning Outcome: 6</p>
12	New Organisational Structures and Opportunities Through IT	1/12 2 hours of lectures 1 hour of tutorials	<ul style="list-style-type: none"> The use of evolving networking, e-commerce and social media technologies within organisations, and their impact on organisational structures and ways of working. <p>Learning Outcome: 6</p>

Related National Occupational Standards (NOS)

Subject Sector Area: Business and Administration (2013)

Related NOS: CFABAA111

Subject Sector Area: Operational Delivery Processing roles

Related NOS: SFJPA1.5.

Assessments

Global Assignment (100%)

6. Results & Certificates

The grade descriptors Pass, Merit and Distinction are awarded by Unit to successful candidates. A Pass is awarded for an overall Unit mark of between 40 and 59. A Merit is awarded for an overall Unit mark of between 60 and 69 and a Distinction is awarded for an overall Unit mark of 70 and above. Candidates who obtain an overall Unit mark of below 40 are classed as *failed* in the Unit and may resist.

A final qualification mark will be awarded upon successful completion of all units. This is calculated by finding the average mark of all units that make up the qualification. Please note that in exceptional circumstances, NCC Education may be required to change the algorithm to calculate a final qualification mark for a learner in order to secure the maintenance of standards over time. Any necessary changes to this algorithm would be shared with Centres and learners promptly by NCC Education.

The final Unit grade awarded will depend on the extent to which a candidate has satisfied the Assessment Criteria. A qualification is awarded when the candidate has achieved at least a pass in all Units.

After each assessment cycle, results slips are issued (in electronic format) which detail the grades achieved, i.e. Fail, Pass, Merit or Distinction. Certificates which contain your qualification grade and pass mark are then dispatched to Centres.

7. Further Information

For more information about any of NCC Education's products please contact customer.service@nccedu.com or alternatively please visit www.nccedu.com to find out more about our suite of high-quality British qualifications.