

LEVEL 5 DIPLOMA IN COMPUTING

(L5DC)

**NCC Education
Qualification Unit Specification
2024 / 25**



LEVEL 5 DIPLOMA IN COMPUTING (L5DC)

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1. About NCC Education

NCC Education is a UK-based awarding body, active in the UK and internationally. Originally part of the 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.

2. Why choose this Qualification

NCC Education's Level 5 Diploma in Computing is:

- **Regulated** by Ofqual and Qualification Wales (QiW) and listed on the Qualifications and Credit Framework – Qualification Number 600/3055/0. 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.

The NCC Education Level 5 Diploma in Computing (L5DC) makes up the second year of the NCC Education degree journey and builds upon the knowledge gained during the NCC Education Level 4 Diploma in Computing (L4DC).

The qualification will introduce students to in-demand computing topics in a range of areas including mobile app development, back-end web development, artificial intelligent, data science, big data, data analysis, ethical hacking and network security and cryptography.

- **Objective**

Candidates will study a balance of academic and vocational subjects in order to provide them with the necessary knowledge and skills to play a significant role in IT organisations.

3. Structure of the L5DC Qualification

Qualification Title, Credits, Units																	
NCC Education's new Level 5 Diploma in Computing (RQF), 120 credits, all at RQF Level 5 Total Qualification Time: 1200 hours Guided Learning Hours: • NCC Education Level 5 Diploma in Computing: 319 -350 hours • NCC Education Level 5 Diploma in Computing (with Business Management): 298 - 329 hours • NCC Education Level 5 Diploma in Computing (with Cyber Security): 384 - 401 hours • NCC Education Level 5 Diploma in Computing (with Data Science): 322 -339 hours Specialist pathways are included within brackets in the qualification title: • NCC Education Level 5 Diploma in Computing • NCC Education Level 5 Diploma in Computing (with Business Management) • NCC Education Level 5 Diploma in Computing (with Cyber Security) • NCC Education Level 5 Diploma in Computing (with Data Science) Please see Section 5 below for Syllabuses, which include the Guided Learning Hours and Total Qualification Time for each Unit of the Level 5 Diploma in Computing. • NCC Education Level 5 Diploma in Computing Candidates must pass 6 Units to be awarded the Level 5 Diploma in Computing certificate. Specialist Units <table> <tr> <td>Agile Development (TQT: 200 hours / 20 credits)</td><td>Mobile App Development (TQT: 200 hours / 20 credits)</td><td>Network Security and Cryptography (TQT: 200 hours / 20 credits)</td></tr> <tr> <td>Computing Project (TQT: 200 hours / 20 credits)</td><td colspan="2"></td></tr> </table> Elective Units <table> <tr> <td>Analysis, Design and Implementation (TQT: 200 hours / 20 credits)</td><td>Artificial Intelligence (TQT: 200 hours / 20 credits)</td><td>Back End Web Development (TQT: 200 hours / 20 credits)</td></tr> <tr> <td>Data Analysis and Visualisation with Python (TQT: 200 hours / 20 credits)</td><td>Introduction to Data Science and Big Data (TQT: 200 hours / 20 credits)</td><td>Professional and Career Development in IT (TQT: 200 hours / 20 credits)</td></tr> <tr> <td>IT Project Management (TQT: 200 hours / 20 credits)</td><td colspan="2"></td></tr> </table>			Agile Development (TQT: 200 hours / 20 credits)	Mobile App Development (TQT: 200 hours / 20 credits)	Network Security and Cryptography (TQT: 200 hours / 20 credits)	Computing Project (TQT: 200 hours / 20 credits)			Analysis, Design and Implementation (TQT: 200 hours / 20 credits)	Artificial Intelligence (TQT: 200 hours / 20 credits)	Back End Web Development (TQT: 200 hours / 20 credits)	Data Analysis and Visualisation with Python (TQT: 200 hours / 20 credits)	Introduction to Data Science and Big Data (TQT: 200 hours / 20 credits)	Professional and Career Development in IT (TQT: 200 hours / 20 credits)	IT Project Management (TQT: 200 hours / 20 credits)		
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IT Project Management (TQT: 200 hours / 20 credits)																	

- **NCC Education Level 5 Diploma in Computing (with Business Management)**

Candidates must pass 6 Units to be awarded the Level 5 Diploma in Computing (with Business Management) certificate.

Specialist Units

Business IT Project (TQT: 200 hours/ 20 credits)	Information Systems and Organisations (TQT: 200 hours / 20 credits)
Principles of Business Operations (TQT: 200 hours/ 20 credits)	IT Project Management (TQT: 200 hours/ 20 credits)

Elective Units

Artificial Intelligence (TQT: 200 hours/ 20 credits)	Data Analysis and Visualisation with Python (TQT: 200 hours/ 20 credits)	Back End Web Development (TQT: 200 hours / 20 credits)
Introduction to Data Science and Big Data (TQT: 200 hours/ 20 credits)	Professional and Career Development in IT (TQT: 200 hours / 20 credits)	

- **NCC Education Level 5 Diploma in Computing (with Cyber Security)**

Candidates must pass 6 Units to be awarded the Level 5 Diploma in Computing (with Cyber Security) certificate.

Specialist Units

Business IT Project (TQT: 200 hours/ 20 credits)	Computer Forensics and Incident Investigation (TQT: 200 hours / 20 credits)
Ethical Hacking and Information Security Assessments (TQT: 200 hours/ 20 credits)	Network Security Threats and Defence Mechanisms (TQT: 200 hours/ 20 credits)

Elective Units

Analysis Design and Implementation (TQT: 200 hours/ 20 credits)	Artificial Intelligence (TQT: 200 hours/ 20 credits)	IT Project Management (TQT: 200 hours / 20 credits)
Professional and Career Development in IT (TQT: 200 hours / 20 credits)		

- **NCC Education Level 5 Diploma in Computing (with Data Science)**

Candidates must pass 6 Units to be awarded the Level 5 Diploma in Computing (with Data Science) certificate.

Specialist Units

Artificial Intelligence (TQT: 200 hours/ 20 credits)	Introduction to Data Science and Big Data (TQT: 200 hours/ 20 credits)
Data Analysis and Visualisation with Python (TQT: 200 hours/ 20 credits)	Business IT Project (TQT: 200 hours/ 20 credits)

Elective Units

Agile Development (TQT: 200 hours/ 20 credits)	Analysis, Design and Implementation (TQT: 200 hours/ 20 credits)
Professional and Career Development in IT (TQT: 200 hours / 20 credits)	IT Project Management (TQT: 200 hours / 20 credits)

4. Assessment for the Qualification

4.1 Assessment Objectives

All assessment for the qualification is intended to allow candidates to demonstrate that 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.

4.2 Overview of the Qualification Unit Assessment

Unit	Assessment Methods	
	Global Assignment	Global Exam
Agile Development	100%	
Mobile App Development	100%	
Network Security and Cryptography	50%	50%
Computing Project	100%	
Analysis, Design and Implementation	100%	
Artificial Intelligence	100%	
Back End Web Development	100%	
Data Analysis and Visualisation with Python	100%	
Introduction to Data Science and Big Data	50%	50%
Professional and Career Development in IT	100% (CV, CPD Plan & career aspirations, mock interview)	
IT Project Management	100% (Case Study)	
Business IT Project	100%	
Information Systems and Organisations	100%	
Principles of Business Operations	100%	
Computer Forensics and Incident Investigation	100%	
Ethical Hacking and Information Security Assessments	100%	
Network Security Threats and Defence Mechanisms	100%	

5. Administration

5.1 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.

5.2 Language of Assessment

All assessment is conducted in English.

5.3 Candidates

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

5.4 Qualification Entry Requirements

For entry onto the NCC Education L5DC qualification students must have at least one of the following:

- NCC Education Level 4 Diploma in Computing (L4DC)

OR

- A local or international qualification which is deemed to be of a similar level to the NCC Education L4DC qualification. This must be agreed with NCC Education in advance.

If a potential student whose first language is not English, they will need to obtain a valid score of 5.5 or above in the International English Language Testing System (IELTS) examination or equivalent.

Alternatively, take the free NCC Education Higher English Placement Test, which is administered by our Accredited Partner Centres.

Direct Entry at Other Points

Many students are expected to join the NCC Education Computing journey at Level 4 or earlier.

However, applications will be accepted for entry at any point and will be accepted, by means of documented evidence, using the following criteria:

- The applicant's general educational background is appropriate for the level of entry.

- The applicant's knowledge of computing is both equivalent to and appropriate for the level of entry.

5.6 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.

5.7 Re-sits

If a candidate fails an assessment, they will be provided with opportunities to re-sit during the eligibility period.

Candidates may only seek reassessment in a previously failed Unit.

5.8 EC Council (L5DC specialism only)

International Council of E-Commerce Consultants, also known as EC-Council, is the world's largest cyber security technical certification body. Operating in 145 countries globally, they are the owner and developer of the world-famous Certified Ethical Hacker (CEH), Computer Hacking Forensics Investigator (CHFI), Certified Security Analyst (ECSA), Licence Penetration Testing (Practical) programmes, among others. They have trained and certified over 300,000 information security professionals globally that have influenced the cyber security mindset of countless organisations worldwide.

The teaching and learning materials for the Computer Forensics and Incident Investigation, Ethical Hacking and Information Security Assessments and Network Security Threats and Defence Mechanisms units have been developed by EC-Council for NCC Education and are the intellectual property of EC-Council.

Once candidates have completed these units, they will be awarded a certificate of attendance from EC-Council. Access to the teaching and learning materials for the Computer Forensics and Incident Investigation, Ethical Hacking and Information Security Assessments, Network Security Threats and Defence Mechanisms units is provided by EC-Council and may require acceptance of additional terms and conditions set by EC-Council.

6 Syllabus

1. Back-End Web Development

Title	Back-End Web Development
Unit reference number	A/651/1086
Credits	20
Level	5
Type	Elective Unit

Guided Learning Hours	72 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will be able to:	Assessment Criteria; The Learner can:
1. Identify and demonstrate an understanding of key concepts and technologies required for back-end website development	1.1 Effectively use relevant underlying technologies and concepts of back-end web-development. 1.2 Explain the differences between front-end, back-end and full stack web development. 1.3 Apply concepts of front-end and back-end communication, APIs and databases. 1.4 Discuss the varieties of tools and techniques used by back-end developers.
2. Demonstrate the skills in back-end programming languages for developing the server-side of a website and integrate it with the front-end	2.1 Identify popular back-end programming languages and explain key differentiations. 2.2 Apply back-end programming techniques in order to create functional web applications. 2.3 Design and code a back-end web application appropriate to a given problem. 2.4 Integrate the back-end with an interactive user interface (UI). 2.5 Develop the back-end web application with a programming language such as PHP, Node.js.

3. Develop a back-end web application alongside databases and servers with capabilities of rapid interaction with the databases	3.1 Design and build a dynamic web application that interacts with a database using server-side scripts and server program. 3.2 Create SQL-driven database queries to facilitate interaction between the web application and the database. 3.3 Explain MySQL technology and execute commands. 3.4 Build, maintain and troubleshoot data-driven websites.
4. Design and implement a web development framework driven server-side application and demonstrate understanding of APIs along with the appropriate frameworks and tools	4.1 Explain the key characteristics of cross-platform development frameworks. 4.2 Describe and effectively use an API. 4.3 Summarise the current trends in development tools and frameworks. 4.4 Apply web back-end frameworks and tools for designing the architecture of a website or web application. 4.5 Develop, test and evaluate a web application based on business requirements/specifications provided.
5. Apply web security concepts for designing a robust web application	5.1 Identify and explain vulnerabilities present in web applications. 5.2 Explain and apply principles and techniques to construct secure web applications. 5.3 Explain hashing and encryption in appropriate contexts.
6. Demonstrate an understanding of building web applications in a collaborative environment with version control and continuous integration / continuous deployment (CI/CD) process to deploy to cloud based servers	6.1 Explain the use of version control software and Git systems. 6.2 Use version control software to track changes and collaborate with tools such as GitHub. 6.3 Explain principles of continuous integration / continuous deployment and concepts of DevOps. 6.4 Describe cloud-based web deployment.

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction to the unit and Back-End Web Development	1/12 2 hours of lectures 4 hours of laboratory sessions	- What is Back-end Development and what does a back-end web server application do? - Front-end vs back-end development. - Skills needed for back-end developer. - Evolution of back-end web development. - Define and explain key concepts, tools and technologies of back-end web development. Learning Outcome: 1
2	Back-end Languages I	1/12 2 hours of lectures 4 hours of laboratory sessions	- List and differentiate various back-end programming languages. - Introduction to PHP. - PHP functions and programming basics. - PHP advanced concepts: reading and writing files, reading data from a file. - OOP using PHP. Learning Outcome: 2
3	Back-end Languages II	1/12 2 hours of lectures 4 hours of laboratory sessions	- Intro to Node.js - Install Node.js and NPM - Modules, NPM modules - Node.js basics and syntax - Node.js global and reserved keywords - Debugging Node.js programs Learning Outcome: 2
4	Web APIs	1/12 2 hours of lectures 4 hours of laboratory sessions	- Introduction to web APIs - REST vs SOAP API - REST API methods: POST, GET, PUT, DELETE - Create REST API Step by Step Learning Outcome: 4
5	Database Driven Website I	1/12 2 hours of lectures 4 hours of laboratory sessions	- Databases for Web Applications - Types of Databases in Web Application (Relational, NoSQL, Graph Databases) - Introduction to SQL language - Introduction to MySQL - Query, retrieve and update relational databases with SQL. - Introduction to concept of PostgreSQL and difference with MySQL. Learning Outcome: 3

6	Database Driven Website II	1/12 2 hours of lectures 4 hours of laboratory sessions	• Introduction to SQL Syntax • SQL Select statement • SQL commands • Introduction to MySQL • Query, retrieve and update relational databases with SQL and MySQL Learning Outcome: 3
7	Database Driven Website III	1/12 2 hours of lectures 4 hours of laboratory sessions	• SQL vs NoSQL • Introduction to JSON • MongoDB Overview • MongoDB Documents and Collections • MongoDB Query API • MongoDB CRUD Operations Learning Outcome: 3
8	Back-end Web Frameworks	1/12 2 hours of lectures 4 hours of laboratory sessions	• What is a Back-end Web Framework and its benefits? • Different various types of back-end web frameworks • Introduction to PHP framework, e.g. Laravel • Introduction to Express framework for Node.js Learning Outcomes: 4
9	Web Development with Express.js	1/12 2 hours of lectures 4 hours of laboratory sessions	• Installing and using Express.js • Express.js features • Error handling, API handling and debugging • Express app with MongoDB • Security and deployment Learning Outcomes: 4

10	Technology Stack for Web Development	1/12 2 hours of lectures 4 hours of tutorials	• Introduction to considerations for mobile and web app development • Introduction to version control and CI/CD • Cloud deployment • What does Stack mean? • Choose the right tech-stack for your project • Full-Stack Development and its benefits • MEAN Stack Development and its benefits • MERN Stack Development and its benefits • Comparison: Full Stack vs MEAN Stack vs MERN Stack Learning Outcomes: 1,2,3,4,6
11	Web Application Security	1/12 2 hours of lectures 4 hours of tutorials	• Web privacy • Cross-Site Scripting (XSS) • Security Misconfiguration • Sensitive Data Exposure Learning Outcomes: 5
12	Unit Summary	1/12 2 hours of lectures 4 hours of laboratory sessions	Learning Outcomes: All

Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: TECIS1201402, TECIS1201501, TECHDUDL1, TECHDUDC2, TECHDUDC3

Assessments

Global Assignment (100%)

2. Business IT Project

Title	Business IT Project
Unit reference number	F/652/2239
Credits	20
Level	5
Type	Specialist Unit

Guided Learning Hours	24 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Identify and analyse a system, issue or problem of current interest within the context of computing and Web	1.1 Describe the problem / issue and project rationale, together with its context. 1.2 Articulate the project aims and objectives.
2. Manage the project effectively demonstrating systematic and effective planning, progress monitoring, reflection and use of time and resources	2.1 Identify appropriate method and tools. 2.2 Produce a project plan. 2.3 Identify and prioritise project risks. 2.4 Monitor and evaluate progress against a project plan.
3. Conduct an in-depth investigation of the context and where appropriate, literature and other similar products	3.1 Plan and undertake research activities in an appropriate and systematic way. 3.2 Explain the research methods used and their limitations in terms of validity and reliability. 3.3 Evaluate research material. 3.4 Synthesise a course of action from the evaluation of material.
4. Employ appropriate methods, tools and techniques to achieve the project aims and objectives	4.1 Select and justify the use of methods, techniques and tools. 4.2 Employ and appropriately document the use of methods, techniques and tools.
5. Systematically evaluate the activities undertaken to fulfil the aim of the project	5.1 Identify success criteria and judge strengths and weaknesses of the project process and outcomes. 5.2 Reflect on the process of conducting the project, identifying learning achieved. 5.3 Articulate and demonstrate the outcomes of the project.

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction	1/12 2 hours project session 2 hours of tutorials	• Choosing your project • Typical and appropriate projects • Planning your project • Selecting methods • Risk management • Your Project Proposal Learning Outcomes: 1 & 2
2	Research	1/12 2 hours project session 2 hours of tutorials	• Research methods, purpose, validity, reliability, primary and secondary research, Data collection and analysis • What does research mean for the Business IT Project? ○ Exploring the problem: background ○ Exploring methods of solution and alternatives ○ Documenting Research • Finding appropriate information • Requirements gathering & specification Learning Outcome: 3
3	Methods of solution	1/12 2 hours project session 2 hours of tutorials	• Types of Project: ○ Software construction, ○ Data Science, ○ Research. • Software Development Project Methods: ○ Analysis, Design, modelling. ○ Constructing a solution. • Data Science Methods. • Research Project methods. Learning Outcomes: 4

4	Testing and evaluation	1/12 2 hours project session 2 hours of tutorials	• Testing ○ Explain the purpose and types of testing. ○ Unit tests/ Integration tests/ System tests/ Acceptance Tests ○ Validity & Verification ○ Develop appropriate test plan. ○ Documenting tests (in YOUR project) • Evaluation of your project ○ Evaluation criteria ○ Reflecting on learning Learning Outcome: 5
5	Planning the final report	1/12 2 hours project session 2 hours of tutorials	• Structure of Final Report. • Content of Final Report. • Citations and Referencing. • Appropriate Appendices. • Presentation requirements. • Assessment criteria. Learning Outcomes: 1 -5
6 -12	Project and Report Completion	7/12 112 hrs Private study 4 hours (minimum) meetings with tutor	• Private study time should include weekly supervision meetings with your tutor to discuss your progress. • Project production. • Project presentation. Learning Outcomes: 1 - 5

Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: TECHDUBI1, TECHDUBI2, TECHDUBI3, TECHDUCO1, ESKITU062, ESKITU050

Assessments

Global Assignment (100%)

3. Computing Project

Title	Computing Project
Unit reference number	K/652/2240
Credits	20
Level	5
Type	Specialist Unit

Guided Learning Hours	24 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Identify a suitable computing artefact and development method	1.1 Discuss project rationale, aims and objectives. 1.2 Select and justify an appropriate computing artefact to develop.
2. Project manage the analysis, design, development and, where applicable, deployment of a computing artefact	2.1 Select and justify the use of an appropriate development method. 2.2 Produce a project plan. 2.3 Monitor and evaluate progress against a project plan. 2.4 Identify and prioritise project risks.
3. Carry out the analysis for a computing artefact	3.1 Elicit and prioritise requirements. 3.2 Produce a requirements specification. 3.3 Produce appropriate analysis models.
4. Design and develop a computing artefact	4.1 Produce a design specification. 4.2 Select and use appropriate tools to construct a computing artefact.
5. Test a computing artefact	5.1 Develop appropriate test plan. 5.2 Test that a computing artefact meets its requirements.
6. Systematically evaluate the activities undertaken to fulfil the aim of the project	6.1 Identify success criteria and judge strengths and weaknesses of the project process and outcomes. 6.2 Reflect on the process of conducting the project, identifying learning achieved. 6.3 Articulate and demonstrate the outcomes of the project.

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction	1/12 2 hours project session 2 hours of tutorials	• Choosing your project • Appropriate artefacts • Planning your project • Development methods • Risk management • Your Project Proposal Learning Outcomes: 1 & 2
2	Analysis Specifications	1/12 2 hours project session 2 hours of tutorials	• SDLC Review • Requirements Elicitation • Requirements Specification • Analysis models • Use Cases • System architecture • Documentation for YOUR project Learning Outcome: 3
3	Design Specifications	1/12 2 hours project session 2 hours of tutorials	• Design and Development ○ Computational Thinking ○ Design models ○ User Interface Design ○ Design Patterns and Frameworks ○ Selecting appropriate tools and environment. • Design & Development Documentation ○ Structure ○ Contents Learning Outcomes: 4
4	Test Scripts	1/12 2 hours project session 2 hours of tutorials	• Types of testing • Appropriate types of testing • Black box / White box/ Grey box • Unit tests/ Integration tests/ System tests/ Acceptance Tests • Test plan • Test scripts • Documenting tests Learning Outcome: 5

5	Planning the Final Report	1/12 2 hours project session 2 hours of tutorials	• Structure of Final Report • Content of Final Report • Citations and Referencing (Reminder) • Appropriate Appendices • Presentation and Demonstration requirements. Learning Outcomes: 1 -6
6 -12	Project and Report Completion	7/12 116 hours Private study 4 hours (minimum) meetings with tutor	• Private study time should include weekly meetings with your tutor to discuss your progress. • Project production • Project presentation and demonstration. Learning Outcomes: 1 - 6

Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: ESKITP4024, ESKITP4034, ESKITP4054, ESKITP4055, ESKITP4064

Assessments

Global Assignment (100%)

4. Data Analysis and Visualisation with Python

Title	Data Analysis and Visualisation with Python
Unit reference number	D/651/1087
Credits	20
Level	5
Type	Specialist/Elective Unit

Guided Learning Hours	58 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Demonstrate knowledge and apply principles of data science to analyse business problems	1.1 Explain the purpose and benefits of data science. 1.2 Explain the key technologies of data analytics. 1.3 Apply data analysis to solve business problems.
2. Be able to produce, comprehend and run Python code using Jupyter Notebook	2.1 Make effective use of the features of Jupyter Notebook to execute Python programs. 2.2 Understand the fundamentals of Python. 2.3 Create programs to solve simple problems.
3. Be able to analyse and interpret data using relevant Python packages	3.1 Load, clean and transform raw data for better understanding, decision making and timely analysis using Pandas. 3.2 Perform statistical analysis techniques to make data-driven decisions using Pandas and Numpy. 3.3 Construct and interpret simple linear regression models and decision tree classifiers.
4. Create effective visualisations using Matplotlib and Seaborn	4.1 Present data attractively using Matplotlib and Seaborn. 4.2 Create static and interactive visualisations with Matplotlib. 4.3 Choose appropriate chart types to accurately represent different types of data.
5. Apply data analysis and visualisation techniques to real-world datasets	5.1 Apply appropriate data analysis techniques to real-world datasets. 5.2 Construct and interpret simple linear regression models and decision tree classifiers. 5.3 Use appropriate visualisation techniques to communicate insights of data clearly.

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction to Data Analytics and Analytics Tools	1/12 2 hours of lectures 2 hours of tutorials	- What are data analytics? - Tools used for data analytics - Benefits of data analytics for today's businesses Learning Outcome: 1
2	Introduction to Jupyter Notebook	1/12 2 hours of lectures 2 hours of tutorials	- Set up Jupyter Notebook - Create a notebook - Run python scripts - Interface - Terminologies
3	Introduction to Python I	1/12 2 hours of lectures 3 hours of laboratory	- Functions, conditional statements, logic - Exception handling - Data types Learning Outcome: 2
4	Introduction to Python II	1/12 2 hours of lectures 3 hours of laboratory	- Loops - List - Dictionary - Debugging Learning Outcome: 2
5	Working with Numpy Array	1/12 2 hours of lectures 3 hours of laboratory	- Numpy Array Object - Data types, axis, shape - Slice a subset of data - Data manipulation - Broadcasting - Arithmetic functions - Basic statistical functions - Reading from/writing to file Learning Outcomes: 3, 5
6	Statistical Fundamentals	1/12 2 hours of lectures 3 hours of laboratory	- Types of variables - Measures of central tendency - Measures of dispersion - Normal distribution Learning Outcome: 3, 5

7	Getting Started with Pandas	1/12 2 hours of lectures 3 hours of laboratory	• Creating Series and DataFrame • Selection • Subsetting • Data cleaning techniques Learning Outcome: 3,5
8	Simple Linear Regression	1/12 2 hours of lectures 3 hours of laboratory	• Simple Linear Regression • Error term (residual), slope, intercept • Ordinary Least Square (OLS) • Scatter plot • Regression plot • Interpretation of the model • Assumptions for regression • Prediction • R-squared and its limitations Learning Outcomes: 3,5
9	Decision Tree for Classification	1/12 2 hours of lectures 3 hours of laboratory	• Decision Tree terminologies and components • Constructing a tree • Entropy • Information Gain • Gini Index • Dividing a dataset • Overfitting • Python scikit-learn Learning Outcomes: 3, 4, 5
10	Data Visualisation	1/12 2 hours of lectures 3 hours of laboratory	• Matplotlib • Seaborn • Line chart • Scatter chart • Various bar charts • Box plot • Heatmap • Good practice Learning Outcomes: 4,5
11	Classification in Machine Learning	1/12 2 hours of lectures 3 hours of laboratory	• Types of machine learning algorithms • Outliers • Feature scale • Cross Validation • Imbalanced data • Common evaluation metrics Learning Outcomes: 3, 5

12	Unit Summary	1/12 2 hours of lectures 3 hours of laboratory	• Data cleaning • Basic statistical analysis • Simple linear regression • Decision tree for classification • Use examples to illustrate these concepts <i>Learning Outcomes: All</i>
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Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: TECHDUBI2, TECHDUDA2, TECIS806301, ESKITU052, ESKITU061, ESKITU070

Assessments

100% Global Assignment

5. Agile Development

Title	Agile Development
Unit reference number	R/652/2243
Credits	20
Level	5
Type	Specialist/Elective Unit

Guided Learning Hours	60 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Understand the background to Agile development	1.1 Summarise the background to Agile development. 1.2 Explain Agile development in relation to other development approaches.
2. Understand the roles within an Agile development team	2.1 Explain the roles in an Agile development team. 2.2 Evaluate the need for a particular role within an Agile development team for a particular project scenario.
3. Understand the various Agile development techniques	3.1 Explain the various Agile development techniques. 3.2 Evaluate the need for a particular Agile development technique for a particular project scenario.
4. Understand an Agile development lifecycle	4.1 Describe an Agile development lifecycle. 4.2 Explain the documentation required to support an Agile development lifecycle. 4.3 Evaluate the use of an Agile development lifecycle for a particular project scenario.

5. Understand the principles associated with an Agile development approach	5.1 Describe the principles associated with an Agile development approach.
6. Be able to apply an Agile development approach to a particular project scenario	6.1 Describe how to apply an Agile development approach to a particular problem scenario. 6.2 Suggest and justify the members of an Agile development team for a particular project scenario. 6.3 Suggest and justify the use of particular Agile development techniques for a particular project scenario. 6.4 Define a document set to support an Agile development approach for a particular project scenario. 6.5 Populate a document set to support an Agile development approach for a particular project scenario.

Syllabus			
Topic No	Title	Proportion	Content
1	An Overview of Agile	1/12 2 hour of lectures 2 hours of seminars 1 hour of tutorials	- An introduction and overview of the Agile Development unit - What is Agile? - the history - What Agile Approaches Learning Outcomes: 1 & 5
2	The Agile Approach and Principles	1/12 2 hours of lectures 2 hours of seminars 1 hour of tutorials	- What is DSDM? - Philosophy of Agile and benefits - The 8 principles - The 5 key techniques - The Instrumental success factors - The Project Approach Questionnaire Learning Outcomes: 1 & 5
3	Modelling	1/12 2 hours of lectures 2 hours of seminars 1 hour of tutorials	- What is a model? - Links to the 8 principles - Viewpoints for modelling - Modelling within the Agile lifecycle Learning Outcomes: 3 & 6

4	Roles, Skills and Team Structures	1/12 2 hours of lectures 2 hours of seminars 1 hour of tutorials	• Agile team style (self-directing, empowered) • Agile team size and reasons • Project level roles and responsibilities • Solution Development Team roles and responsibilities • Specialist roles and other supporting roles Learning Outcomes: 2 & 6
5	Lifecycle and Products	1/12 2 hours of lectures 2 hours of seminars 1 hour of tutorials	• The purpose of the configurable lifecycle • The 5 main phases and the two further phases of the lifecycle • For each phase: – Objectives – Preconditions – Points to consider • Products related to lifecycle phases • The three essential perspectives for the products Learning Outcomes: 4 & 6
6	Project Management Considerations Part 1: Control Risk	1/12 2 hours of lectures 2 hours of seminars 1 hour of tutorials	• Key differences in style between Traditional and Agile project management • Control parameters in an Agile project • Communication including daily Stand Ups • Empowerment and escalation • Risk in an Agile project Learning Outcomes: 1, 2 & 6
7	Project Management Considerations Part 2: Quality and Testing	1/12 2 hours of lectures 2 hours of seminars 1 hour of tutorials	• Configuration management • Quality and maintainability • Testing concepts • Metrics Learning Outcomes: 1, 2 & 6

8	Facilitated Workshops	1/12 2 hours of lectures 2 hours of seminars 1 hour tutorials	• What is a Facilitated workshop? • The role of the Facilitator; co-facilitator/scribe; participants. • Workshop planning • Workshop success factors Learning Outcomes: 6
9	Requirements Definition and Prioritisation	1/12 2 hours of lectures 2 hours of seminars 1 hour tutorials	• What is a requirement in Agile? • Defining requirements: User story format (as a... I need... in order to...) • Functional and non-functional requirements • Format and content of a requirement • The Prioritised Requirements List • MoSCoW as a key technique • Requirements and modelling Learning Outcomes: 6
10	Iterative Development and Prototyping	1/12 2 hours of lectures 2 hours of seminars 1 hour tutorials	• What is a prototype? • What is iterative development? • Prototyping perspectives: – Functional – Usability – Non-functional – Capability/Technique prototype: Architectural Spike and Proof of Concept • Horizontal, Vertical and Combined development strategies • Prototyping: Identify, plan, evolve, review. • Iterative development as a key technique Learning Outcomes: 6

11	Estimating and Timeboxing	1/12 2 hours of lectures 2 hours of seminars 1 hour tutorials	• The estimating process • Factors affecting an estimate • Estimating approaches • Problems with estimates • What is a timebox? • Timebox structure (Identify, plan, evolve, review) • Timebox links to MoSCoW and requirements • Delivery (increment) planning • Timebox planning • Timeboxing as a key technique Learning Outcomes: 6
12	Unit Summary and Revision Guidance	1/12 2 hours of lectures 2 hours of seminars 1 hour tutorials	• Revision Learning Outcomes: All

Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: TECIS805401, TECIS805301, TECIS806401

Assessments

Global Assignment (100%)

6. Mobile App Development

Title	Mobile App Development
Unit reference number	F/651/1088
Credits	20
Level	5
Type	Specialist Unit

Guided Learning Hours	57 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Understand the scope and position of mobile apps within the context of software development	1.1 Explain the key characteristics of mobile apps. 1.2 Discuss the scope and limitations of mobile apps. 1.3 Discuss the issues of developing apps for multiple platforms.
2. Demonstrate a critical understanding of the range of current development architectures, platforms, languages and tools	2.1 Explain the key characteristics of native apps. 2.2 Explain the key characteristics of cross-platform development frameworks. 2.3 Summaries current trends in development tools. 2.4 Discuss the relative merits of native and cross-platform approaches for a well-defined scenario.
3. Plan and design a mobile application with appropriate features	3.1 Explain the SDLC in relation to Mobile Apps. 3.2 Employ appropriate methods to specify and design a well-defined app with limited complexity.
4. Develop application functionality with an appropriate programming language and software development kit (SDK)	4.1 Install and use Android Studio or other appropriate IDE. 4.2 Make use of common User Interface elements that can be used to construct the application interface on a mobile platform. 4.3 Write, test and debug native code for a well-defined app.
5. Employ Object Oriented techniques in development of a mobile App	5.1 Explain the key concepts of OO development and their benefits. 5.2 Make appropriate use of inheritance in design / coding the app. 5.3 Discuss the relative merits of well-known software design patterns used in mobile app development.

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction to Mobile App Development	1/12 2 hours of lectures 2 hours of tutorials 2 hours of laboratory sessions	• What is a Mobile App? • Platforms: smart phone, tablet, wearable devices • Operating systems: E.g. Android, iOS, Tizen. • Apps in the context of software systems • Challenges for app developers • Developing for multiple platforms • Web apps vs native apps • Quality, Security, • Distribution: Deployment, Market place, users • Trends Learning Outcome: 1
2	Introduction to Technologies for App Development	1/12 2 hours of lectures 2 hours of tutorials 2 hours of laboratory sessions	• Technologies: native APIs and SDKs, • HTML5, hybrid Web apps, XML, Ajax, Json. • Hybrid technology: HTML5, CSS, advanced JavaScript, jQuery Mobile. Hybrid technology: HTML5, CSS, advanced JavaScript, jQuery Mobile. • Frameworks (E.g. Ionic, React Native, Framework7, Flutter, PhoneGap). • MVC Design Pattern • Progressive Web Apps Learning Outcome: 1,2
3	App Development Processes	1/12 2 hours of lectures 2 hours of laboratory sessions	• SDLC applied to mobile apps • Selecting technology • Mobile HCI: Usability, IA, standards, UI, interface design, touch design patterns. • Quality Management: testing, debugging, maintenance, updates. • Application types: social, games, data-driven Learning Outcome: 2,3
4	Using an IDE for Mobile App Development	1/12 2 hours of lectures 2 hours of laboratory sessions	• Purpose of IDE • Range of IDEs for Mobile Development • Android Studio overview ○ Downloading/ installing ○ Features ○ Supported platforms ○ Exploring the User Interface ○ Creating a simple App using built-in template ○ Emulator ○ Languages supported Learning Outcome: 4

5	Object Orientated Programming for Mobile Apps (1)	1/12 2 hours of lectures 2 hours of laboratory sessions	- Review of OO concepts and techniques - Encapsulation, abstraction, inheritance and polymorphism. - Classes, Objects - Introduction to Kotlin - Terminology - Data types - Variables, values Learning Outcomes: 4, 5
6	Object Orientated Programming for Mobile Apps (2)	1/12 2 hours of lectures 2 hours of laboratory sessions	- Introduction to Kotlin - Selection - Iteration - Functions, parameters - Classes, inheritance - Constructors - Properties Learning Outcome: 4, 5
7	App Development - Getting Started	1/12 2 hours of lectures 3 hours of laboratory sessions	- Creating a basic App - Views - Adding Images and Text - Constraints Learning Outcomes: 4, 5
8	App Development: Classes and Objects, Database	1/12 2 hours of lectures 3 hours of laboratory sessions	- Buttons and other views - Importing libraries - Introduction to MySQL Learning Outcomes: 4,5
9	App Development: Database	1/12 2 hours of lectures 3 hours of laboratory sessions	- Connecting Kotlin with MySQL - Getting user input - CRUD Example Learning Outcomes: 4,5

10	App Development: Location-Based	1/12 2 hours of lectures 3 hours of laboratory sessions	• Geolocation • Maps and Displayable lists • Camera Learning Outcomes: 4
11	App Development: Navigation	1/12 2 hours of lectures 3 hours of laboratory sessions	• Navigation architecture • Navigating between screens • JETPACK • Search Engine Optimisation (SEO) • Architecture components Learning Outcomes: 4,5
12	Deployment and Testing	1/12 2 hours of lectures 2 hours of tutorials	• Testing • Configuration control • Github • Deployment Learning Outcome 1

Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: TECHDUBI1, TECHDUBI3, TECHDUCW1, ESKITU050, ESKITU060, ESKITU061, ESKITU062, ESKITU063

Assessments

Global Assignment (100%)

7. Network, Security and Cryptography

Title	Network, Security and Cryptography
Unit reference number	L/652/2241
Credits	20
Level	5
Type	Specialist Unit

Guided Learning Hours	60 hours	Total Qualification Time	200 hours
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Learning Outcomes The Learner will:	Assessment Criteria The Learner can:
1. Demonstrate a systematic understanding of the concept of Network Security and Cryptography	1.1 Explain the concept of Network Security and Cryptography along with the relationship among two. 1.2 Explain the components and approaches of Network Security. 1.3 Understand the need and applications of network security and cryptography.
2 Critically evaluate the suitability of different Cryptographic Algorithms	2.1 Demonstrate the evolution of cryptographic algorithms and the need in modern networks. 2.2 Identify different types of cryptographic algorithms. 2.3 Demonstrate a systematic awareness of the theoretical foundations on cryptanalysis.
3 Understand the vulnerabilities and systematically evaluate the security risks in networks	3.1 Understand the security risks in different components of networks. 3.2 Demonstrate a systematic awareness on different types of attack on the network systems.
4 Critically analyse appropriate tool and techniques for network security	4.1 Understand and evaluate a range of modern security techniques and defence mechanisms. 4.2 Systematically evaluate the suitability of different network security techniques for different types of networks. 4.3 Make use of cutting-edge tools and technologies to provide network security.
5 Understand the wireless network security and associated protocols	5.1 Explain the vulnerabilities inherent in wireless networks. 5.2 Understand the wireless network infrastructure and the associated security protocols. 5.3 Evaluate and identify different types of wireless security methods and tools.
6 Explain the concepts of Information Security and explain	6.1 Critically analyse and prioritise information security risks.

good practice in achieving security	6.2 Systematically identify countermeasures and review techniques appropriate to the management of information security risks. 6.3 Demonstrate a thorough understanding of the policy and technology trade-offs involved in developing information security systems of adequate quality. 6.4 Analyse and evaluate the significance of legal regulations and requirements on information security systems.
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Syllabus			
Topic No	Title	Proportion	Content
1	Network Security and Cryptography Fundamentals	1/12 2 hours of lectures 3 hours of tutorials	- What is Network Security? - Principles of network Security - Model for Network Security - Approaches of Network Security - Introduction to Cryptography - Cryptography Fundamentals Learning Outcome: 1
2	Cryptography Techniques	1/12 2 hours of lectures 3 hours of tutorials	- Classical Cryptography - Symmetric Key Cryptography Learning Outcome: 1,2
3	Cryptography Techniques	1/12 2 hours of lectures 3 hours of lab	- Asymmetric Key Cryptography - Hash Function/digital signatures - Message Authentication Code Learning Outcome: 2,3
4	Operating System Security and Vulnerabilities	1/12 2 hours of lectures 3 hours of lab	- Operating System Security basics - User Authentication - Unix Access Control Learning Outcome: 3
5	Software Vulnerabilities and attacks	1/12 2 hours of lectures 3 hours of tutorials	- Software vulnerabilities: Input validation, Race conditions, Buffer overflows, etc. - Malwares - Worms Learning Outcome: 3

6	Network Security and Defence	1/12 2 hours of lectures 3 hours of lab	• Why Network Security • Common Network Security Attacks • Internet Security Learning Outcome: 1,4
7	Email and Web Security	1/12 2 hours of lectures 3 hours of tutorials	• Email Security, S/MIME • Web security considerations • DNS security Learning Outcome: 4
8	Firewalls	1/12 2 hours of lectures 3 hours of lab	• Why Firewall • Types of Firewalls • Bastion Host • Intrusion Detection and Prevention Learning Outcome: 4
9	VLAN and VPN	1/12 2 hours of lectures 3 hours of tutorials	• Introduction to VLAN • VLAN Tagging • Introduction to VPN • Types of VPN • VPN protocols Learning Outcome: 4
10	Wireless Security	1/12 2 hours of lectures 3 hours of tutorials	• Introduction to Wireless Networks • Wireless security (WEP, WPA, WPA2) Learning Outcome: 1,5
11	Information Security Management	1/12 2 hours of lectures 3 hours of tutorials	• Information Security: Overview, culture and governance • Legal Regulation and Compliance • Risk Management Learning Outcome: 6
12	Unit Summary	1/12 3 hours of lectures 2 hours of tutorials	Learning Outcome: ALL

Related National Occupational Standards (NOS)
Sector Subject Area: ICT Practitioners Related NOS: TECIS1201401, TECIS1201402, TECIS1201403, TECIS1201404, TECIS1201405, TECIS1201501

Assessments
50% Exam 50% Global Assignment

8. Analysis, Design and Implementation

Title	Analysis, Design, and Implementation
Unit reference number	M/652/2242
Credits	20
Level	5
Type	Elective

Guided Learning Hours	60 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Understand the seamless transition from OO analysis to OO design	1.1 Explain the seamless transition from OO analysis to OO design. 1.2 Identify and describe OO analysis models. 1.3 Identify and describe OO design models.
2. Understand how to convert OO analysis and design models to code	2.1 Explain how to convert OO analysis models to code. 2.2 Explain how to convert OO design models to code.
3. Understand the quality attributes associated with an OO development	3.1 Explain the developer software quality attributes. 3.2 Explain the user software quality attributes.
4. Understand the concept of maintenance within an OO development environment	4.1 Describe what is meant by maintenance of software. 4.2 Identify and define the different types of software maintenance.
5. Be able to produce OO analysis and design models using a case tool	5.1 Use a case tool to produce OO analysis models based on a case study. 5.2 Use a case tool to develop OO design models based on a case study.
6. Be able to convert OO analysis and design models to code using an appropriate IDE	6.1 Use an IDE to develop code based on an OO analysis model. 6.2 Use an IDE to develop code based on an OO design model.

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction to the module	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Introduction to the module • Distinction between analysis and design • The Software Crisis • Recap of key OO concepts Learning Outcomes: 1
2	Paper Prototyping	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Paper prototyping overview • How to do it • What you learn • Why it's useful Learning Outcomes: 1, 2 & 3
3	User Centred Design	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Introduction to UCD • Mental Models • Personas Learning Outcomes: 5 & 6
4	Agile Object Orientation	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Discussion of the OO software development process • Use-case diagrams • Discussion of benefits of OOAD • Discussion of drawbacks of OOAD • OOAD in an agile world Learning Outcomes: 1 & 5

5	Static Analysis and Design	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Requirements gathering • Identifying abstractions • Candidate classes • Class diagrams • Converting class diagrams into code Learning Outcomes: 1 & 5
6	Dynamic Analysis and Design	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Activity diagrams • Sequence diagrams • Converting dynamic models into code Learning Outcomes: 1 & 5
7	Design Case Study	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Worked example from problem statement to design Learning Outcomes: 1, 3 & 5
8	Design Patterns (1)	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Introduction to design patterns • Factory • Abstract Factory Learning Outcomes: 2, 3 & 4
9	Design Patterns (2)	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Introduction to design patterns • Factory • Abstract Factory Learning Outcomes: 2, 3 & 4

10	Elements of Good Design	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Software quality attributes • Software component design • Coupling • Cohesion • The Observer design pattern Learning Outcomes: 3 & 5
11	Redesign and Implementation	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Redesign of case study • Incorporation of design patterns • Implementation of elements of previous design • case study into code Learning Outcomes: 2 & 6
12	Maintenance	1/12 2 hours of lectures 2 hours of laboratory sessions 1 hour of tutorials	• Impact of change • Refactoring • Refactoring case study Learning Outcomes: 4

Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: ESKITP4034, ESKITP4074, ESKITP5034, ESKITP5035

Assessments

Global Assignment (100%)

9. Artificial Intelligence

Title	Artificial Intelligence
Unit reference number	H/651/0322
Credits	20
Level	5
Type	Specialist/Elective Unit

Guided Learning Hours	80 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Understand the importance of AI and its applications	1.1 Explain the meaning of AI and its origin. 1.2 Identify the characteristics of AI. 1.3 Discuss the limitations and ethics of AI. 1.4 Discuss current and future developments in the field of AI and its applications.
2. Apply a range of well-established AI search strategies and knowledge representation techniques in problem solving	2.1 Construct simple state spaces. 2.2 Select and apply appropriate search techniques in problem solving. 2.3 Explain and identify different types of knowledge. 2.4 Apply knowledge representation using the logical, semantic network, frame and production rules techniques.
3. Assess a range of well-established techniques for reasoning with uncertain knowledge	3.1 Explain the concept of uncertainty. 3.2 Explain the source of uncertain knowledge. 3.3 Discuss and apply probabilistic reasoning using the Bayes' rule and the certainty factor theory.
4. Understand a range of machine learning techniques	4.1 Explain machine learning. 4.2 Compare and contrast supervised learning, unsupervised learning and reinforcement learning. 4.3 Identify and apply suitable machine learning techniques in problem solving.
5. Understand the range of AI techniques that are being applied in industry or research	5.1 Describe the key players, components, characteristics and limitations of expert systems. 5.2 Apply reasoning techniques in rule-based expert systems. 5.3 Explain natural language processing and its components. 5.4 Discuss a range of applications using natural

	language processing. 5.5 Explain intelligent agents and PEAS. 5.6 Discuss a range of applications using intelligent agents.
6. Implement and evaluate a range of AI models and techniques for solving real-world problems	6.1 Select suitable tools and techniques for use in designing AI models. 6.2 Construct an AI model. 6.3 Evaluate the performance of AI models.

Syllabus			
Topic No	Title	Proportion	Content
1	Introduction to AI	1/12 2.5 hours of lectures 2.5 hours of exercises	• Definitions • History of AI • Characteristics of AI • Limitations of AI • Ethics in AI • Current and future development of AI and its applications Learning Outcome: 1
2	Problem Solving Using Search	1/12 2.5 hours of lectures 2.5 hours of exercises	• Problem representation in state space • Strategies for state space search • Uninformed search (blind search) • Informed search (heuristic Search) Learning Outcome: 2
3	Knowledge Representation	1/12 2.5 hours of lectures 2.5 hours of exercises	• Types of knowledge • Logical representation • Semantic network representation • Frame representation • Production Rules Learning Outcome: 2
4	Uncertain Knowledge	1/12 2.5 hours of lectures 2.5 hours of exercises	• Uncertainty and its sources • Basic probability • Bayes' rule • Bayesian reasoning • Certainty factors Learning Outcome: 3
5	Fuzzy Logic	1/12 3 hours of lectures 3 hours of exercises	• Fuzzy logic • Linguistic variables • Fuzzy sets and operations • Fuzzy rules • Fuzzy system Learning Outcome: 3

6	Machine Learning	1/12 3 hours of lectures 3 hours of exercises	• Introduction • Supervised learning • Unsupervised learning • Reinforcement learning • Applications of machine learning Learning Outcome: 4
7	Neural Networks	1/12 2 hours of lectures 2 hours of exercises 4 hours of laboratory sessions	• Basic structure • Perceptron • Multilayer neural networks • Backpropagation learning • Accelerated learning • Recurrent neural networks • Learning Outcome: 4, 5
8	Decision Trees	1/12 3 hours of lectures 2 hours of exercise sessions 5 hours of laboratory sessions	• Structure and terminologies • Attribute selection measures • Learning Outcome: 4, 6
9	Genetic Algorithms	1/12 3 hours of lectures 2 hours of exercise sessions	• Simulation of Natural Evolution • Basic genetic algorithms • Learning Outcome: 4

10	Expert Systems	1/12 3 hours of lectures 2 hours of exercise sessions 5 hours of laboratory sessions	• The development team of an expert system • Components of an expert system • Characteristics of an expert system • Rule-based expert system • Learning Outcome: 5, 6
11	Natural Language Processing	1/12 3 hours of lectures 2 hours of exercise sessions 5 hours of laboratory sessions	• Terminologies • Components of natural language processing • Phases in natural language processing • Natural language processing pipeline • Applications of natural language processing • Learning Outcome: 5, 6
12	Intelligent Agents	1/12 3 hours of lectures 2 hours of exercise sessions	• Agents and environments • Rationality • PEAS • Types of intelligent agents • Game Playing • Algorithms in games • Learning Outcome: 5

Related National Occupational Standards (NOS)
Sector Subject Area: ICT Practitioners Related NOS: TECHDUBI3, TECHDUCW1, TECHDUDL1, ESKITU012, ESKITU020, ESKITU040

Assessments
Global Assignment (100%)

10. Introduction to Data Science and Big Data

Title	Introduction to Data Science and Big Data
Unit reference number	T/651/1093
Credits	20
Level	5
Type	Specialist/Elective Unit

Guided Learning Hours	60	Total Qualification Time	200 hours
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Learning Outcomes The Learner will:	Assessment Criteria The Learner can:
1. Demonstrate a systematic and thorough understanding of the concept of Data Science and Big Data	1.1 Explain the concept of Data Science and Big Data along with the relationship among two. 1.2 Explain the components of Data science. 1.3 Understand the need and applications of Data Science and Big Data. 1.4 Understand the role and responsibility of data scientist, big data expert and data analyst. 1.5 Understand and classify different types of data. 1.6 Understand the data quality and issues.
2. Demonstrate proficiency in data collection, design and modelling for data processing	2.1 Demonstrate a systematic awareness of the theoretical foundations of data processing. 2.2 Understand the Data Science Process Life Cycle. 2.3 Identify problems and tasks involved in the life cycle of a Data Science Project. 2.4 Differentiate between different techniques and tools.
3. Select appropriate techniques and tools for data pre-processing	3.1 Clean and prepare data for analysis. 3.2 Identify abnormalities such as missing values, outliers, redundant features, etc. in data. 3.3 Model data for a purpose. 3.4 Summarise and visualise data using suitable tools.

4. Understand the analytical techniques and software tools to effectively generate insights from data	4.1 Turn raw data into insightful information. 4.2 Understand a range of data analysis techniques and models. 4.3 Identify the suitability of different data analysis techniques for different types of Data. 4.4 Make use of cutting-edge tools and technologies to analyse data. 4.5 Understand the need of model selection and evaluation. 4.6 Understand the metrics and scoring for the evaluation of selected model.
5. Understand the suitability of different visualisation methods for different types of Data	5.1 Build big data analysis solutions with analysis methods and visualisation tools. 5.2 Understand the need of businesses and present data. 5.3 Select appropriate visualisation tools and visualise aspects of the data in each dataset. 5.4 Systematically interpret and evaluate the results of data analysis solution to inform the decision-making process.
6. Demonstrate a critical understanding of Data Science Ethics	6.1 Understand the ethical challenges and concerns in data science. 6.2 Understand the ethical challenges and concerns in data science. 6.3 Explore practical solutions for implementing responsible data practices. 6.4 Recognise the importance of fostering a culture of data ethics within an organisation.

Syllabus			
Topic No	Title	Proportion	Content
1	Data Science and Big Data Fundamentals	1/12 2 hours of lectures 3 hours of tutorials	• What is Data Science? • What is Big Data? • What are Data Analytics? • Data Science vs Big Data vs Data Analytics • Components of Data Science • Data Science Process/lifecycle Learning Outcome: 1,2
2	Introduction to Data	1/12 2 hours of lectures 3 hours of tutorials	• What is Data? • How big is Big Data? Some examples • Sources of Data • Big Data Challenges • Data quality and issues • 5V's of Big Data • Types of Data: Structured, Unstructured, Semi Structured • Categories of Data Types: Continuous, Categorical, Text Data, Time Series, Binary. Learning Outcome: 1,2
3	Understanding Data & Exploration	1/12 2 hours of lectures 3 hours of lab session	• What is Descriptive Statistic? • What is Inferential Statistic? • What is EDA? Numerical or Graphical methods • Aims of EDA? • Exploratory vs Confirmatory Data Analysis? • Numerical Methods of EDA: Central Tendency, Measurement of Variability • Graphical Methods of EDA: histogram, box plot, scatter plot, stem and leaf plot. Learning Outcome: 2,3,5
4	Data Pre-Processing I	1/12 2 hours of lectures 3 hours of lab session	• What is Data Pre-processing? • Data Pre-processing Importance? • Data Pre-processing Steps • Data Pre-processing examples? • Data Pre-processing Methods • Missing Values • Categorical Encoding • Feature engineering Learning Outcome: 2, 3

5	Data Pre-Processing II	1/12 2 hours of lectures 3 hours of lab session	• Dimensionality Reduction • Outlier analysis • Class imbalance Learning Outcome: 2,3
6	Data Processing I	1/12 2 hours of lectures 3 hours of lab session	• What is Data Processing? • What is AI and its History? • Difference Between AI, ML and Deep learning • Introduction to Machine Learning • Types of Machine Learning: supervised learning, unsupervised learning. Learning Outcome: 1,4
7	Data Processing II	1/12 2 hours of lectures 3 hours of lab session	• Reinforcement learning • NLP • Deep learning Learning Outcome: 4
8	Model Selection and Evaluation	1/12 2 hours of lectures 3 hours of lab session	• What are model selection and model evaluation? • Types of model selection • Metrics and Scoring Learning Outcome: 4
9	Data Visualisation	1/12 2 hours of lectures 3 hours of lab session	• Data Visualisation • Data Visualisation Process • Advanced data visualisation and processing tools Learning Outcome: 4,5
10	Business Intelligence and Tools	1/12 2 hours of lectures 3 hours of tutorials	• What is Business Intelligence? • Benefits of Business Intelligence • Types of BI tools and software • Example of BI case studies Learning Outcome: 1,3,4
11	Data Science Ethical and Privacy Issues	1/12 2 hours of lectures 3 hours of tutorials	• What is Data Science Ethics? • Accountability and Governance • Data Provenance and Aggregation Learning Outcome: 6

12	Unit Summary	1/12 3 hours of lectures 2 hours of tutorials	<i>Learning Outcome: ALL</i>
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Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: TECDT80841, TECDT80842, TECDT80851, TECIS806401, TECIS805301

Assessments

50% Global Assignment

50% Exam

11. Professional and Career Development in IT

Title	Professional and Career Development in IT
Unit reference number	Y/651/1094
Credits	20
Level	5
Type	Elective

Guided Learning Hours	77 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Demonstrate a critical understanding of employability attributes	1.1 Explain the skills knowledge & attitudes needed for success in the modern world of work. 1.2 Identify skills and knowledge needed for a specific career.
2. Demonstrate a critical understanding of professionalism attributes	2.1 Explore professional codes of practice and explain their relevance. 2.2 Discuss local and international legal imperatives relevant to computing professionals. 2.3 Understand the importance of professionalism and demonstrate appropriate behaviours at interview.
3. Discuss ethical and social issues and impacts related to Computing	3.1 Analyse scenarios and identify ethical issues and formulate a reasoned response. 3.2 Explain a range of examples of the impact of IT on society.
4. Undertake research into suitable careers and employment opportunities	4.1 Explore career opportunities available that match aspirations. 4.2 Identify relevant volunteering opportunities to help develop appropriate skills.
5. Develop a plan for CPD	5.1 Synthesise a plan to develop skills and knowledge to achieve career aspirations. 5.2 Produce a CV . 5.3 Complete job applications and/or a covering letter. 5.4 Perform appropriate presentations and interviews.
6. Participate constructively in teamwork	6.1 Work supportively as a member of a team. 6.2 Demonstrate leadership in a team situation.

Syllabus			
Topic No	Title	Proportion	Content
1	Employability Introduction	1/12 2 hours of lectures 4.5 hours of tutorials	• Definition of employability? Skills, Attitudes, Abilities • Soft skills required by employers • Hard skills required by employers • What do employers say they want? • E.g. Google, BAE, Apple and Hewlett Packard • Other research findings and surveys on modern business requirements and the changing role of the IT professional: • How candidates/prospective employees can demonstrate employability? • Lifelong learning/Work-life balance Learning Outcome: 1
2	Self-evaluation of skills/behaviours and areas for development	1/12 2 hours of lectures 4.5 hours of tutorials	• Auditing your skills • Identifying opportunities for learning and development • Creating a CPD plan for career development • Creating your CV Learning Outcome: 1, 5
3	Career Opportunities	1/12 2 hours of lectures 4.5 hours of tutorials	• Careers advice • Finding and researching suitable vacancies • Exploring careers and job opportunities available Learning Outcome: 4
4	Teamwork	1/12 2 hours of lectures 4.5 hours of tutorials	• Principles of good teamwork • Leading teams • Team exercises • Team presentation Learning Outcome: 6
5	Interviews	1/12 2 hours of lectures 4.5 hours of tutorials	• Gaining an interview • Interview advice: what to do and what to avoid • Practice interviews • Other recruitment tools available • Feedback Learning Outcome: 5

6	Ethics	1/12 2 hours of lectures 4.5 hours of tutorials	• Definition of ethics • Ethical dilemmas in Computing • Case studies: e.g., Bitcoin and Crypto currency, AI and Facial recognition, Bias Learning Outcome: 3
7	Professionalism	1/12 2 hours of lectures 2 hours of tutorials	• Definition of professionalism • Codes of conduct, e.g., BCS, ACM, ISACA • Professional bodies Learning Outcome: 2
8	Legal Imperatives	1/12 2 hours of lectures 4.5 hours of tutorials	• Typical laws related to computing ◦ International (eg GDPR) ◦ Local state laws and penalties Learning Outcome: 2
9	Social Impact of Computing	1/12 2 hours of lectures 4.5 hours of tutorials	• Exploring the impact of IT on society • Case studies :E.g. Social media, Internet, World Wide Web, Ecommerce, Robotics, AI, smartphones. Learning Outcome: 3
10	Practical Workshop 1	1/12 7 hours workshop tutorials	• Developing of skills through practical activities • Practice interviews • Produce a current CV • Conduct a presentation • Visiting inspirational speaker Learning Outcome: 5
11	Practical Workshop 2	1/12 7 hours workshop tutorials	• Developing of skills through practical activities • Practice interviews • Produce a current CV • Conduct a presentation • Visiting inspirational speaker Learning Outcome: 5

12	Practical workshop 3	1/12 7 hours workshop tutorials	• Developing of skills through practical activities • Practice interviews • Produce a current CV • Conduct a presentation • Visiting inspirational speaker <i>Learning Outcome: 5</i>
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Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: N/A

Assessments

100% Assignment (CV, CPD Plan & career aspirations, mock interview)

12. Information, Systems & Organisations

Title	Information, Systems & Organisation
Unit reference number	H/617/8478
Credits	20
Level	5
Type	Specialist Unit

Guided Learning Hours	48 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Analyse the use of Information Systems (IS) within organisations	1.1 Assess the importance of IS in organisations as a store for data, information and knowledge. 1.2 Discuss the different social contexts and stakeholder perspectives of IS. 1.3 Understand the relationship between IS and process change within organisations.
2. Examine the many internal and external uses of an organisation's IS	2.1 Explain how IS contributes to the management of knowledge within organisations. 2.2 Analyse how interactions with customers and external parties can be managed using IS.
3. Critically evaluate the costs and benefits of a range of IS systems	3.1 Discuss the costs and benefits involved in implementing new IS. 3.2 Analyse the importance of having a balanced portfolio of IS that supports organisational strategy.
4. Critically evaluate the cultural, structural and political aspects of IS	4.1 Assess the effects of IS on organisational structure and central decision-making. 4.2 Analyse the political aspects of IS.
5. Examine the issues associated with human interaction with IS	5.1 Assess the IS needs of a range of individuals. 5.2 Discuss the legal and ethical issues surrounding IS. 5.3 Analyse how IS can be used to increase commitment and control in an organisation. 5.4 Describe the issues surrounding the acceptance of new technology.

6. Assess the effects of technological change on IS and the organisations	6.1 Evaluate the process of implementing new IS. 6.2 Explain how to identify and influence stakeholders when implementing new IS.
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Syllabus			
Topic No	Title	Proportion	Content
1	Organisations and Information Systems	1/12 2 hours of lectures 2 hours of tutorials	Data, information and knowledge. The uses and importance of IS to organisations Learning Outcome: 1
2	Social Contexts and Perspectives on IS	1/12 2 hours of lectures 2 hours of tutorials	Social contexts within organisations, different perspectives, technology interaction with the organisation Learning Outcome: 1
3	Internal IS and Enterprise Systems	1/12 2 hours of lectures 2 hours of tutorials	Evolution and classification of IS, information flows, processes and enterprise wide systems Learning Outcome: 2
4	Organisational Strategy and IS	1/12 2 hours of lectures 2 hours of tutorials	Alignment to organisational needs. Ensuring the IS portfolio supports the business and supports stakeholders Learning Outcome: 3
5	Evaluating IS	1/12 2 hours of lectures 2 hours of tutorials	Sources of cost and benefit, tangible and intangible factors, formal-rational evaluation, wider criteria for evaluating IS. Learning Outcome: 3

6	Cultural, Structural and Political Aspects of IS	1/12 2 hours of lectures 2 hours of tutorials	Culture and IS, how IS affect structure, central and local decision making, political aspects of IS Learning Outcome: 4
7	People and IS Interpretation	1/12 2 hours of lectures 2 hours of tutorials	Human needs, information ownership, legal and ethical issues. Data security Learning Outcome: 5
8	The 21 st Century Organisation	1/12 2 hours of lectures 2 hours of tutorials	Using IS for commitment and control, managing distributed work. Evolution of working practices Learning Outcome: 5
9	User Acceptance and the Socio-technical Approach	1/12 2 hours of lectures 2 hours of tutorials	Technology acceptance and the socio-technical approach. HCI and usability considerations Learning Outcome: 5
10	IS and the Customer	1/12 2 hours of lectures 2 hours of tutorials	Dealing with customers, suppliers and partners. eBusiness Learning Outcome: 6
11	IS and Organisational Change	1/12 2 hours of lectures 2 hours of tutorials	Implementing IS and the context of change, critical aspects of a project, understanding models of change, identifying and influencing stakeholders Learning Outcome: 6
12	Benefits Management	1/12 2 hours of lectures 2 hours of tutorials	Characteristics of successful IS implementations Learning Outcome: 6

9.	User Acceptance and the Socio-technical Approach	• Technology acceptance and the socio-technical approach • HCI and usability considerations Learning Outcome: 5
10.	IS and the Customer	• Dealing with customers, suppliers and partners • eBusiness Learning Outcome: 2
11.	IS and Organisational Change	• Implementing IS and the context of change • Critical aspects of a project • Understanding models of change • Identifying and influencing stakeholders Learning Outcome: 6
12.	Benefits Management	• Characteristics of successful IS implementations Learning Outcome: 6

Related National Occupational Standards (NOS)

Sector Subject Area: Business Management

Related NOS: INSBA001, INSBA005, INSBA006, INSBA010, INSBA013, CFABAC121, CFABAD321, CFABAD323

Assessments

Global Assignment (100%)

13. Principles of Business Operations

Title	Principles of Business Operations
Unit reference number	Y/617/8476
Credits	20
Level	5
Type	Specialist Unit

Guided Learning Hours	48 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Examine the frameworks of operations management	1.1 Evaluate the principles of operations management. 1.2 Analyse the key activities in operations management and how they have changed over time. 1.3 Analyse the use, design and development of value chains. 1.4 Discuss the methods used to measure the performance of operations management activities. 1.5 Assess how customers' wants and needs drive operations strategy.
2. Analyse the use of technology in operations management	2.1 Examine how new technologies are used in value chains. 2.2 Assess how technology is used to create integrated operating systems.
3. Assess the design of goods and services	3.1 Examine how goods and services are designed 3.2 Examine how production and design processes are developed
4. Analyse how operations management processes are developed	4.1 Assess the layout of facilities and processes. 4.2 Examine the need for workplace and job design. 4.3 Discuss the components and design of supply chains. 4.4 Assess the process and the use of forecasting in short and long-term decisions relating to capacity 4.5 Discuss the need for accurate resource planning and scheduling. 4.6 Analyse the importance of various quality measures in operations management.

5. Evaluate the use of lean operations	5.1 Examine the underlying principles of lean operations. 5.2 Analyse the use of 'just-in-time' systems.
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Syllabus			
Topic No	Title	Proportion	Content
1	Introduction to Operations	1/12 2 hours of lectures 2 hours of tutorials	The nature of Operations and Introduction to Business Operations concepts Learning Outcome: 1
2	Value Chains and Global Operations	1/12 2 hours of lectures 2 hours of tutorials	Value Chain Design and Development and their context in global operations Learning Outcome: 1
3	Frameworks for Operations Management	1/12 2 hours of lectures 2 hours of tutorials	The scope of Performance Management and designing performance management and measurement systems Learning Outcome: 1
4	Operations for Business Competitiveness	1/12 2 hours of lectures 2 hours of tutorials	Operations strategy and competitive priorities – understanding customers wants and needs Learning Outcome: 1
5	Using Technology	1/12 2 hours of lectures 2 hours of tutorials	Issues relating to operations design, technologies, implementation and management Learning Outcome: 2
6	Goods and Services	1/12 2 hours of lectures 2 hours of tutorials	Designing goods and services in an operations context Learning Outcome: 3

7	Facilities Design	1/12 2 hours of lectures 2 hours of tutorials	Facility design and layout decisions in an operations context Learning Outcome: 4
8	Supply Chains and Facilities Location	1/12 2 hours of lectures 2 hours of tutorials	Designing supply chains and facilities location decisions Learning Outcome: 4
9	Capacity	1/12 2 hours of lectures 2 hours of tutorials	Managing operations capacity and forecasting for business operations Learning Outcome: 4
10	Resources	1/12 2 hours of lectures 2 hours of tutorials	Managing operations resource planning and scheduling Learning Outcome: 4
11	Quality	1/12 2 hours of lectures 2 hours of tutorials	Managing operations quality in a global context Learning Outcome: 4
12	Managing Operations	1/12 2 hours of lectures 2 hours of tutorials	Lean operations and just-in-time systems Learning Outcome: 5

Related National Occupational Standards (NOS)

Sector Subject Area: Business Management

Related NOS: CFABAG121, CFAMLB, CFAMLF3

Assessments

Global Assignment (100%)

14. IT Project Management

Title	IT Project Management
Unit reference number	L/651/0325
Credits	20
Level	5
Type	Specialist/Elective Unit

Guided Learning Hours	60 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Demonstrate a critical understanding of the nature of IT Projects, their activities and challenges	1.1 Define the term project and explain the activities involved in an IT project. 1.2 Explain typical activities in the system development life cycle (SDLC). 1.3 Discuss the challenges involved in an IT project. 1.4 Describe different approaches to project lifecycles.
2. Explain and use project planning principles and techniques to address broadly defined, complex problems	2.1 Explain the need for and purpose of project planning. 2.2 Produce a suitable project plan for a broadly defined complex problem. 2.3 Compare and contrast product based and activity-based planning methods and discuss their relationship. 2.4 Explain and use work and product breakdown structures (WBS and PBS). 2.5 Explain and use activity networks (activity on node diagrams). 2.6 Explain and use Gantt charts. 2.7 Discuss the principles, methods, advantages and disadvantages and relative accuracy of different estimating techniques.
3. Explain and apply procedures needed to monitor, control and report upon an IT project	3.1 Explain the purpose of monitoring and control and the project control cycle. 3.2 Explain activities and information involved in monitoring and controlling a project. 3.3 Identify and justify appropriate methods for monitoring and controlling a complex project scenario. 3.4 Discuss methods of change control and configuration management in the context of a project scenario. 3.5 Discuss the impact on the project of deviations and changes to project plan

4. Demonstrate a critical understanding of quality, its attributes and how it can be assessed and assured	4.1 Define product quality and software quality. 4.2 Distinguish quality control and quality assurance. 4.3 Discuss how quality can be measured. 4.4 Discuss the role, concepts and processes of ISO9000/ISO9126.
5. Discuss and apply the principles of project risk management	5.1 Define the concept of risk. 5.2 Explain the typical risks associated with IT projects. 5.3 Discuss the relative merits of quantitative and qualitative approaches to risk assessment. 5.4 Discuss different ways of controlling risk and their relative merits in a specific scenario. 5.5 Identify, represent and prioritise risks using a risk probability matrix for a specific scenario. 5.6 Construct a risk register for a specific project scenario.
6. Demonstrate a critical understanding of project organisation and teamwork	6.1 Explain the typical organisation for a large complex project. 6.2 Discuss the role of team building theory in the composition of project teams. 6.3 Explain the typical roles and responsibilities of stakeholders in a large complex project.

Syllabus content			
Topic No	Title	Proportion	Course coverage
1.	Introduction to ITPM	1/12 2 hours of lectures 3 hours of tutorials	- What is a project? - Project management Iron Triangle. - The nature of IT Projects and their challenges. - Typical activities in the system development life cycle. - The need for project management - Process models: Waterfall, Incremental, Iterative, Agile. - Prince 2 Learning Outcome: 1

2.	Stages in a Project	1/12 2 hours of lectures 3 hours of tutorials	• Project Initiation. • Feasibility studies and the establishment of a business case for a project. • Project set up. • Requirements elicitation, analysis and verification: purpose and methods. • Establishing project objectives, goals and measures of success. • Project management using a lightweight or agile approach with particular reference to incremental (i.e. delivering functionality to the users in small steps) and iterative (i.e. presenting a series of versions of the same software component for user evaluation) approaches. • Installation issues, including methods of going live. • Project closure and post implementation activities. • Project support activities, including configuration management and change control. Learning Outcome: 1
3.	Project Planning I	1/12 2 hours of lectures 3 hours of tutorials	• Approaches to planning: Product-based and activity-based planning. • Work and product breakdown structures (WBS and PBS). • Activity networks (activity on node diagrams). • Critical path analysis. Learning Outcome: 2
4.	Project Planning II	1/12 2 hours of lectures 3 hours of tutorials	• Project Schedule. • Gantt chart. • Resource allocation, resource types and resource clashes, identifying dependencies, creating critical path. • Agile approaches to planning: time-boxing; product and sprint backlogs; prioritisation using MoSCoW rules. Learning Outcome: 2

5.	Estimation	1/12 2 hours of lectures 3 hours of tutorials	• What to estimate and why? • Effort, Duration, Cost • Estimates and targets • Impact of over and under estimating • Elements of successful estimation • Principles, methods, advantages and disadvantages and relative accuracy of different estimating approaches: • parametric/algorithmic models • expert judgment, Delphi approach, Kickoff meeting, estimation sessions • analogy, • top-down • bottom-up Learning Outcomes: 2
6.	Monitoring and Control	1/12 2 hours of lectures 3 hours of tutorials	• Purpose of monitoring and control: key project metrics related to time/progress, costs, scope/size of functionality and quality; • The project control cycle: where and when to monitor; • Project control through monitoring; use of plans in project control • Report cycle: whom to report to and how to report; the reporting hierarchy. • Types of report: exception, progress (or checkpoint), management (e.g. highlight reports) • Monitoring and control of project finances and quality • Earned value analysis: planned and earned value, actual costs; cost and schedule performance indicators, including their graphical representation. • Corrective action and implications on the project of deviations and changes to project plan Learning Outcome: 3

7.	Change Control and Configuration Management	1/12 2 hours of lectures 3 hours of tutorials	• Reasons for change control and configuration management • Change control procedures: • Change control board • Generation, evaluation and authorisation of change requests • Configuration management • Purpose of procedures • Identification of configuration items • Product baselines • Configuration management databases • Version control (Git hub) Learning Outcomes: 3
8.	Quality	1/12 2 hours of lectures 3 hours of tutorials	• Definition of product quality and software quality • Quality assurance and quality control, • Measurement of quality • Defects: detection and removal. Testing and reviews • Project audit and quality audit • Types of testing • Management and control of testing • ISO 9000 series and ISO 9126 principles, methods and role • Process and product quality approaches: capability maturity models Learning Outcome: 4

9.	Risk	1/12 2 hours of lectures 3 hours of tutorials	• The concept of risk • Project Success measures • Risk identification: types of risk, risk checklists • Typical risks associated with IT projects and information systems • Qualitative and quantitative methods of assessing risk exposure and relative advantages • Risk prioritization: assessment of likelihood/ probability and impact of risk; • Probability impact grid • Risk treatment (avoidance, acceptance, transfer, mitigation) • Controlling risk: risk management tactics, including risk avoidance, risk transfer, risk reduction, risk mitigation and contingency planning • Risk registers • Information security risk assessment, ISO27001, NIST • <i>Learning Outcomes: 5</i>
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10.	Project Organisation	1/12 2 hours of lectures 3 hours of tutorials	• Programmes and Projects • Identifying stakeholders and their concerns • Establishing the project authority / board • Membership of project board/ steering committee • Roles and responsibilities of project manager, team managers and team leaders • Desirable characteristics of project manager • Role of project support office • Project team and matrix management • Reporting structures and responsibilities • Management styles and communication • Team building theory and practice, structures and • responsibilities, including Belbin's team roles and Tuckman- Jensen stages of team evolution (forming, storming, norming, performing) • How to staff a project stage with appropriate skill sets; how and where to obtain skilled personnel • Appropriate management styles for development projects • Team management, motivation, retention Learning Outcomes: 6
11.	Case study	1/12 2 hours of lectures 3 hours of tutorials	Learning Outcomes: All
12.	Summary	1/12 2 hours of lectures 3 hours of tutorials	Learning Outcomes: All

Related National Occupational Standards (NOS)
Sector Subject Area: ICT Practitioners Related NOS: TECHDUBI1, TECHDUBI3, TECHDUCW1, TECHDUDA3, TECHDUSS1

Assessments
100% Assignment

15. Computer Forensics and Incident Investigation

Title	Computer Forensics and Incident Investigation
Unit reference number	T/618/1451
Credits	20
Level	5
Type	Specialist Unit

Guided Learning Hours	80 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Understand the fundamental concept of computer forensics, incident response and different types of cybercrimes	1.1 Define computer forensics. 1.2 Assess cybercrime investigation and the different types of cybercrimes. 1.3 Discuss rules of forensic investigation. 1.4 Describe the roles, the different types and the characteristics of digital evidence. 1.5 Discuss federal rules of evidence and the sources of potential evidence. 1.6 Discuss computer forensics as part of incident response plan.
2. Recognise the roles and responsibilities of a forensic investigator	2.1 Argue the need for a forensic investigator. 2.2 Discuss the roles and responsibilities of a forensic investigator and what makes a good forensic investigator? 2.3 Explain legal issues, privacy issues and the code of ethics for a forensic investigator.
3. Know the various phases involved in the computer forensic investigation process and the importance of chain of custody	3.1 Explain the importance and various phases of the computer forensics investigation process. 3.2 Identify the requirements for building a computer forensics lab and an investigation team. 3.3 Assess the roles of a first responder and the importance of chain of custody. 3.4 Discuss data duplication, deleted data recovery and evidence examination. 3.5 Describe what an expert witness is and explain how to close a case.

4. Analyse the physical and logical structure of a hard disk	4.1 Assess different types of disk drives. 4.2 Describe the physical and logical structure of a hard disk. 4.3 Explain the different types of hard disk interfaces and components. 4.4 Describe hard disk partitions. 4.5 Explain the Windows, Mac and Linux boot processes.
5. Comprehend various types of file systems such as Windows, Linux, Mac OS and analyse various RAID storage systems.	5.1 Discuss various types of file systems. 5.2 Understand RAID storage systems and explain the different levels of the storage system. 5.3 Discuss file system analysis and file carving.
6. Understand the importance of data acquisition and determine the best acquisition method and tools	6.1 Discuss the importance of data acquisition. 6.2 Discuss live and static data acquisition. 6.3 Explain and review data acquisition and duplication steps. 6.4 Determine the best acquisition methods and how to select appropriate data acquisition tools. 6.5 Explain how to perform data acquisition on Windows and Linux machines.
7. Identify the goals, challenges and techniques of anti-forensics	7.1 Explain Anti-forensics. 7.2 Assess the goals and review anti-forensics techniques. 7.3 Interpret the steps for detecting Rootkits. 7.4 Explains various type of anti-forensics tools.
8. Understand how to collect and examine volatile and non-volatile data in Windows and Linux machines	8.1 Explain how to collect and examine volatile and non-volatile data in Windows and Linux machines. 8.2 Examine the cache, cookie and history recorded in web browsers. 8.3 Examine Windows files and metadata. 8.4 Analyse text based logs and Windows event logs. 8.5 Explain various Linux based shell commands and log files. 8.6 Explain the need for Mac forensics and examine Mac forensics data and log files.

Syllabus		
Topic No.	Topic title	Course coverage
1.	Computer Forensics in Today's World – Part One	• Understanding Computer Forensics • Types of Cybercrimes • Challenges Cyber Crimes Present to Investigators • Cyber Crime Investigation • Rules of Forensics Investigation • Understanding Digital Evidence • Sources of Potential Evidence Learning Outcomes: 1, 2
2.	Computer Forensics in Today's World - Part Two	• Rules of Evidence • Forensics Readiness • Computer Forensics as Part of Incident Response Plan • Need for Forensic Investigator • Roles and Responsibilities of Forensics Investigator • What makes a Good Computer Forensics Investigator? • Legal and Privacy Issues • Code of Ethics • Accessing Computer Forensics Resources Learning Outcomes: 1, 2
3.	Computer Forensics Investigation Process - Part One	• Importance of Computer Forensics Process • Phases Involved in the Computer Forensics Investigation Process • Pre-investigation Phase • Investigation Phase • Computer Forensics Investigation Methodology Learning Outcomes: 3
4.	Computer Forensics Investigation Process - Part Two	• Computer Forensics Investigation Methodology: Documentation and Reporting • Computer Forensics Investigation Methodology: Testify as an Expert Witness Learning Outcomes: 3
5.	Understanding Hard Disks and File Systems - Part One	• Disk Drive Overview • Disk Partitions • Understanding File Systems • RAID Storage System Learning Outcomes: 4, 5
6.	Understanding Hard Disks and File Systems - Part Two	• File System Analysis Learning Outcomes: 4, 5
7.	Data Acquisition and Duplication - Part One	• Understanding Data Acquisition • Live Data Acquisition • Static Data Acquisition Learning Outcomes: 6

8.	Data Acquisition and Duplication - Part Two	• Determine the Data Acquisition Format • Validate Data Acquisitions • Acquisition Best Practices Learning Outcomes: 6
9.	Defeating Anti-forensics Techniques - Part One	• What is Anti-Forensics? • Anti-Forensics Techniques Learning Outcomes: 7
10.	Defeating Anti-forensics Techniques - Part Two	• Anti-Forensics Techniques • Anti-Forensics Tools Learning Outcomes: 7
11.	Operating System Forensics - Part One	• Introduction to OS Forensics • Windows Forensics • Collecting Volatile Information • Collecting Non-Volatile Information • Analyse the Windows Thumb caches • Windows Memory Analysis • Windows Registry Analysis • Cache, Cookie and History Analysis • Windows File Analysis • Metadata Investigation Learning Outcomes: 8
12.	Operating System Forensics - Part Two	• Text Based Logs • Other Audit Events • Forensic Analysis of Event Logs • Linux forensics • Shell Commands • Linux Log files • Collecting Volatile Data • Collecting Non-Volatile Data • Mac Forensics • Introduction to MAC Forensics • MAC Forensics Data • MAC Log Files • MAC Forensics Tools Learning Outcomes: 8

Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: N/A

Assessments

Global Assignment (100%)

16. Ethical Hacking and Information Security Assessments

Title	Ethical Hacking and Information Security Assessments
Unit reference number	A/618/1452
Credits	20
Level	5
Type	Specialist Unit

Guided Learning Hours	80 hours	Total Qualification Time	200 hours
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Learning Outcomes The Learner will:	Assessment Criteria; The Learner can:
1. Assess ethical and legal requirements of security assessment	1.1 Evaluate the current security trends. 1.2 Describe the elements of information security. 1.3 Explain information security threats and attack vectors. 1.4 Describe hacking concepts, types and phases. 1.5 Explain information security controls. 1.6 Explain the penetration testing process. 1.7 Discuss information security Acts and Laws.
2. Understand different types of footprinting, tools and countermeasures	2.1 Describe footprinting concepts. 2.2 Perform footprinting through multiple platforms including; search engines, web services, social networking sites, website, email and competitive intelligence. 2.3 Perform Whois, DNS, network and social engineering footprinting. 2.4 Use different footprinting tools and apply best practice. 2.5 Perform footprinting penetration testing.
3. Understand different types of network scanning techniques and enumerations countermeasures	3.1 Describe the network scanning concepts. 3.2 Use various scanning tools and techniques to perform scanning penetration testing and to check for live systems and open ports. 3.3 Scan beyond intrusion detection system (IDS) and firewalls. 3.4 Perform banner grabbing. 3.5 Draw network diagrams using network discovery tools.

4. Analyse different enumerations techniques and different vulnerabilities	4.1 Describe the enumeration concepts. 4.2 Explain different techniques for NetBIOS, SNMP, LDAP, NTP, SMTP AND DNS enumeration. 4.3 Explain other enumerations such as IPsec, VoIP, RPC and Linux/Unix enumeration. 4.4 Understand vulnerability research and vulnerability classification. 4.5 Describe different characteristics of good vulnerability assessment solutions. 4.6 Explain different types of vulnerability assessment tools.
5. Understand the system hacking methodology	5.1 Describe the CEH Hacking Methodology. 5.2 Explain different techniques to gain access to the system and apply privilege escalation. 5.3 Explain different techniques to create and maintain remote access to the system. 5.4 Describe different types of rootkits. 5.5. Explain steganography and steganalysis techniques. 5.6 Apply different techniques to hide the evidence of compromise. 5.7 Perform system hacking penetration testing.
6. Compare and contrast different types of malware	6.1 Describe the concepts of malware and malware propagation techniques. 6.2 Describe the concepts of Viruses, Trojans and Worms, their types and how they infect files / systems. 6.3 Perform malware analysis and explain different techniques to detect malware. 6.4 Perform malware penetration testing and apply malware countermeasures.
7. Assess various packet sniffing techniques	7.1 Describe the packet sniffing concepts. 7.2 Explain different MAC and DHCP attacks. 7.3 Describe ARP and DNS poisoning. 7.4 Use different packet sniffing tools and apply packet sniffing countermeasures. 7.5 Apply various techniques to detect packet sniffing. 7.6 Perform packet sniffing penetration testing.
8. Assess various social engineering and Dos/DDoS attack techniques	8.1 Describe social engineering concepts and techniques to perform it. 8.2 Describe identity theft and perform impersonation on social networking sites. 8.3 Apply social engineering and identify theft countermeasures. 8.4 Perform social engineering and DoS/DDoS penetration testing. 8.5 Describe the DoS/DDoS concepts, explain different DoS/DDoS attack tools and the techniques used to perform DoS/DoS. 8.6. Apply best practices to mitigate DoS/DDoS attacks.

Syllabus		
Topic No.	Topic title	Course coverage
1.	Introduction to Ethical Hacking	• Information security • Hacking, Ethical Hacking concepts and penetration testing concepts • Information Security Controls Learning Outcomes: 1
2.	Footprinting and Reconnaissance	• Footprinting Methodology • Footprinting Tools • Footprinting Countermeasures • Footprinting Penetration Testing Learning Outcomes: 2
3.	Scanning Networks	• Network Scanning Concepts • Network Scanning Techniques • Network Scanning Pen Testing • Network Scanning Beyond IDS and Firewall Learning Outcomes: 3
4.	Enumeration	• Enumeration Concepts • Enumeration Countermeasures • Enumeration Pen Testing Learning Outcomes: 4
5.	Vulnerability Analysis	• Vulnerability Assessment Concepts • Assessment Solutions • Scoring Systems • Assessment Tools • Assessment Reports Learning Outcomes: 4
6.	System Hacking – Part One	• System Hacking Concepts • Cracking Passwords • Escalating Privileges Learning Outcomes: 5
7.	System Hacking – Part Two	• Escalating Privileges • Executing Applications • Hiding Files • Covering Tracks • Penetration Testing Learning Outcomes: 5
8.	Malware Threats – Part One	• Malware Concepts • Trojan Learning Outcomes: 6
9.	Malware Threats – Part Two	• Virus and Worm • Malware Analysis • Countermeasures • Malware Penetration Testing Learning Outcomes: 6
10.	Packet Sniffing	• Packet Sniffing Concepts • Packet Sniffing Techniques Learning Outcomes: 7

11.	Social Engineering	• Social Engineering Concepts • Social Engineering Techniques <i>Learning Outcomes: 8</i>
12.	Denial-of-Service	• DoS/DDoS Concepts • DoS/DDoS Attack Techniques <i>Learning Outcomes: 8</i>

Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: N/A

Assessments

Global Assignment (100%)

17. Network Security Threats and Defense Mechanisms

Title	Network Security Threats and Defense Mechanisms
Unit reference number	F/618/1453
Credits	20
Level	5
Type	Specialist Unit

Guided Learning Hours	80 hours	Total Qualification Time	200 hours
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Learning Outcomes; The Learner will:	Assessment Criteria; The Learner can:
1. Understand fundamental networking concepts, analyse protocols and implement established standards	1.1 Assess the different types of computer networks. 1.2 Describe and compare the OSI and TCP/IP network models 1.3 Explain the different types of networks and their topologies. 1.4 Describe various network components. 1.5 Explain the various protocols in TCP/IP protocol stack. 1.6 Explain IP addressing.
2. Be able to assess potential vulnerabilities and threats to a network's infrastructure	2.1 Explain threat, attack and vulnerability concepts. 2.2 Discuss network security concerns. 2.3 Discuss the different categories of network security breach and the effects on business continuity. 2.4 Discuss the different categories of network security vulnerabilities and network attacks. 2.5 Describe the fundamental elements of network security. 2.6 Describe the different types of access controls and their mechanisms.

3. Understand the working of encryption, protocols and policies	3.1 Explain network data encryption mechanisms. 3.2 Describe Public Key Infrastructure (PKI) 3.3 Describe various network security protocols and network security devices. 3.4 Discuss security policies and their hierarchy. 3.5 Explain designing, creating and implementing security policies. 3.6 Understand the need to enforce and train on security policies. 3.7 Discuss various information security related standards, laws and acts.
4. Identify and analyse the issues with physical security, operating systems and Network-based applications	4.1 Discuss the need for physical security, the factors that affect it and the selection of appropriate physical security controls. 4.2 Describe various access control authentication techniques. 4.3 Explain workplace security, personnel security, environmental controls and the importance awareness and training. 4.4 Explain the purpose of a host, host security, related threats and baselining. 4.5 Assess security requirements for different types of servers, hardening of routers and switches. 4.6 Understand data / virtualisation security at rest, motion and use.
5. Understand the fundamental concept of a Firewall	5.1 Explain firewalls and firewall security concerns. 5.2 Discuss firewall technologies and understand the selection of firewall topologies . 5.3 Design and configuration of the firewall ruleset and policies. 5.4 Discuss the factors to consider before purchasing a firewall solution. 5.5 Explain how to deploy, implement, configure and test a firewall. 5.6 Describe the management, maintenance and administration of a firewall. 5.7 Explain firewall logging, firewall security best practices and measures in avoiding firewall evasion.

6. Understand the role and workings of IDS/IPS in network defence	6.1 Explain different types of intrusions and their indications. 6.2 Explain IDPS and the importance of implementing an IDPS. 6.3 Describe the role, functions and components of an IDS and how one works. 6.4 Describe a staged deployment of NIDS and HIDS. 6.5 Describe IDS fine-tuning by minimising false positives and the false negative rate. 6.6 Discuss the characteristics of a good IDS implementation, mistakes made and their remedies. 6.7 Explain the various types of IDPS implementations and the requirements for selecting an appropriate IDSP product. 6.8 Discuss the technologies which complement IDS functionality.
7. Understand the purpose of Virtual Private Networks	7.1 Explain how a Virtual Private Network (VPN) functions and be able to describe its components. 7.2 Explain the importance for establishing a VPN. 7.3 Describe the implementation for VPN concentrators and functions. 7.4 Explain the different VPN technologies. 7.5 Discuss the process for selecting the correct VPN technology for your needs. 7.6 Explain VPN topology implementation and functions. 7.7 Discuss VPN security concerns and performance.

Syllabus		
Topic No.	Topic title	Course coverage
1.	Computer Network and Defence Fundamentals	• Comparing OSI and TCP/IP • Types of Networks and Topologies • Network Hardware Components • TCP/IP Protocol Stack • IP Addressing • Understanding Computer Network Defence (CND) • CND Process and Approaches Learning Outcomes: 1
2.	Network Security Threats, Vulnerabilities and Attacks	• Network Security Concerns • Types of Network Security Threats, Vulnerabilities and Attacks Learning Outcomes: 2
3.	Network Security Controls, Protocols and Devices – Part One	• Fundamental Elements of Network Security • Network Security Controls Learning Outcomes: 2, 3
4.	Network Security Controls, Protocols and Devices – Part Two	• Network Security Devices • Network Security Protocols Learning Outcomes: 2, 3
5.	Network Security Policy Design and Implementation	• What is a Security Policy? • Workplace Plans and Policies Learning Outcomes: 3
6.	Physical Security	• Need for Physical Security • Factors Affecting Physical Security • Physical Security Controls • Access Control Authentication Techniques and Other Measures • Workplace and Personnel Security • Laptop Security tool: EXO5 • Environmental Controls • Physical Security: Awareness/Training and Checklists Learning Outcomes: 4
7.	Host Security – Part One	• Host and OS Security • User and Password Management • Patch Management • Methods to Secure Host System (Windows) • Install Antivirus Software • Email Security • Enabling Pop-Up Blocker • Windows Log Review and Audit

		• Configuring Host-Based IDS/IPS • File System Security • Creating and Securing a Windows File Share • Data and File System Encryption • Linux Security • Understanding and Checking Linux File Permissions • Host-Based Firewall Protection with IPtables Learning Outcomes: 4
8.	Host Security – Part Two	• Linux Log Review and Audit • Hardening Servers • Logs Review and Audit • Data Security • What is Data Loss Prevention? • Virtualisation Terminologies Learning Outcomes: 4
9.	Secure Firewall Configuration and Management	• What Firewalls Do and How Do They Work • Firewall rules • Types of Firewalls • Firewall Technologies and Topologies • Build an Appropriate Firewall Ruleset • Implement Firewall Policy • Firewall Implementation, Deployment and Administration • Firewall Logging • Why Bypass Firewalls? • Secure Firewall Implementation: Best Practices • Firewall Implementation: Recommendations • Firewall Tools Learning Outcomes: 5
10.	Secure IDS Configuration and Management – Part One	• Intrusion Detection and Prevention System (IDPS) • Role of an IDS in Network Defence • How does an IDS work? • IDS Components • Intrusion Detection Steps • Types of IDS Implementation • Staged IDS Deployment • Types of IDS Alerts Learning Outcomes: 6
11.	Secure IDS Configuration and Management – Part Two	• Characteristics of a Good IDS • IDS Mistakes to avoid • Intrusion Prevention Systems (IPS) Technologies • IPS Placement and Functions • What does an IPS do? • IDS vs IPS • Types of an IPS • IDPS product selection • Complementing an IDS • Vulnerability analysis or assessment systems • File integrity checkers • Honeypot and Padded-Cell System Tools • IDS Evaluation: Snort • IDS/IPS Solutions Learning Outcomes: 6

12.	Secure VPN Configuration and Management	• How does a VPN work? • Why Establish a VPN? • VPN Components • VPN Concentrators and Functions • Types of VPNs and Appropriate Selection • VPN Core Functionalities • VPN Technologies, Topologies, Concerns and Security • Improving VPN Speed • Quality of Service (QoS) in VPNs • SLAs for a VPN • VPN Service Providers • Auditing and Testing the VPN • Testing VPN File Transfer • Best Security Practices for VPN Configuration • Recommendations for VPN Connections <i>Learning Outcomes: 7</i>
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Related National Occupational Standards (NOS)

Sector Subject Area: ICT Practitioners

Related NOS: N/A

Assessments

Global Assignment (100%)

7 Results and 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 *fail* in the Unit and may resit.

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.

8 Further Information

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