Awarding Great British Qualifications

Level 2 Diploma in Computing

(L2DC)

NCC Education
Qualification Unit Specification
2025 / 26

LEVEL 2 Diploma in Computing (L2DC)

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1. About NCC Education

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

With Centres in over forty countries, four international offices and academic managers worldwide, NCC Education strives to employ the latest technologies for learning, assessment, and support.

NCC Education develop qualifications 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 2 Computing qualifications are designed for learners aged 14 and above, catering to both Key Stage 4 students and adult learners.

The program is ideal for:

- Learners beginning their computing studies journey.
- Non-native English speakers with sufficient English proficiency to undertake assessments successfully.

NCC Education's Level 2 Computing qualifications are:

1. **Regulated** by Ofqual and Qualification Wales (QiW) under the Regulated Qualifications Framework (RQF).

2. **Quality assured** and well established in the UK and worldwide.

3. **A valuable suite of qualifications in Computing** which offer learners a variety of valuable skills and knowledge, preparing them for further education or entry-level positions in the tech industry. Here are some key benefits:

    - **Foundational Skills**: Learners gain essential computing skills, including coding, digital literacy, and computational thinking.

    - **Practical Experience**: Modules include hands-on projects and real-world applications.

    - **Career Preparation**: The course can open doors to various career paths in IT, such as software engineering, web development, and IT support. It also provides a recognised qualification that can enhance employability

    - **Further Education**: Completing NCC Level 2 Computing can lead to advanced studies, such as a Level 3 diploma or an apprenticeship, further expanding career opportunities

    - **Industry-Relevant Skills**: Learners are introduced to current technologies and trends, ensuring they are well-prepared for the modern digital workplace

4. **A pathway** to NCC Education's Level 3 Diploma qualifications and greater employment opportunities.

3. Structure of the Level 2 Computing Qualification

Qualification Titles, Credits, Units

NCC Education's Level 2 Diploma in Computing (RQF), 48 credits, all at RQF Level 2

Total Qualification Time: 480 hours

Guided Learning Hours (GLHs) for core units: 298

Candidates must pass all 4 units to be awarded the L2 Diploma in Computing.

This qualification is for learners aged 14 years and above who want to further their knowledge and understanding of computing through learning. The qualification prepare learners for a range of higher education courses and job roles related to a particular sector.

Achieving the Level 2 Diploma in Computing, with a minimum grade of pass, provides progression onto NCC Education's Level 3 Computing courses.

Units

To gain the Diploma, learners **MUST** achieve the following 4 units equal to the total of 48 credits.

Computational Problem Solving (TQT: 120 hours/ 12 credits)	Computer Systems and Networking (TQT: 120 hours/ 12 credits)	Cloud Computing (TQT: 120 hours/ 12 credits)	Digital Collaboration and Communication Skills (TQT: 120 hours/ 12 credits)

Summary of the units' credits, number of topics and the breakdown of the Total Qualification Time:

Unit type	No.	Unit	Credits	No. of topics	Tot. class time (hrs)	Tot. Practical time (hrs)	Tot. Quizzes time (hrs)	Tot. private study time (hrs)	TQT (hrs)	Tot GLHs
Core	1	Computational Problem Solving	12	12	48	18	12	24	120	78
	2	Computer Systems and Networking	12	12	48	16	12	24	120	76
	3	Cloud Computing	12	12	48	12	12	24	120	72
	4	Digital Collaboration and Communication Skills	12	12	48	12	12	36	120	72

4. Assessment for the Qualification

• Assessment Objectives

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

• Overview of Qualification Unit Assessment

Unit	Assessment Method	
	Local Exam	Global Assignment
Computer Systems and Networking	30% MCQ	70% Assignment
Digital Collaboration and Communication Skills	30% MCQ	70% Assignment
Cloud Computing	30% MCQ	70% Assignment
Computational Program Solving	30% MCQ	70% Assignment

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

An examination is an assessment that will take place on a specified date and usually in an NCC Education Centre. An assignment requires candidates to produce a written response to a set of one or more tasks, meeting a deadline imposed by the Centre. Local Examinations and Global Assignments are marked by the centre.

NCC Education Centres can provide candidates with a specimen assessment paper as well as a limited number of past examination and assignment papers.

Past examination and assignment papers may be made available only following results release for the corresponding assessment cycle. Results release dates and past examination and assignment release dates can be found in the Activity Schedules on Quartz, NCC Education's student registration system.

5. Administration

• 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.

• Language of Assessment

All assessment is conducted in English.

• Candidates

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

• Qualification Entry Requirements

Students must meet the following entry requirements:

- Be working towards their GCSE/IGCSE 'O' Levels or an equivalent qualification in their own country and be predicted 4 subjects with minimum grades of 'C', '4' or equivalent* in each. These should include Mathematics and English.

- The NCC Education Level 2 Computing suite syllabus and assessment is suitable for candidates aged 14 and above (at Key Stage 4 of the English national curriculum) as well as older (including adult) learners.

- It is expected that candidates who are non-native English speakers are able to cope with the demands of preparing for and taking the NCC Education Level 2 Computing suite qualification assessment in English.

• 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.

• Resits

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

If a candidate has passed an assessment, they are eligible for 1 additional re-take only. The highest mark for the assessment will be awarded.

6. Results & Certificates

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

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 relevant units.

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

7. Further Information

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

8. Syllabus

1. Computational Problem Solving

Unit Overview

This unit aims to provide a comprehensive foundation in computational problem solving, equipping students with the skills and knowledge needed to tackle complex problems using computational methods.

Learners will learn the fundamental concepts of computational thinking, including problem decomposition, pattern recognition, abstraction, and algorithm design. Basics of programming languages, syntax, and semantics will be included in this unit. Learners will become proficient in basic programming constructs such as variables, control structures, sequence, and selection, and will be able to write simple programs.

Title	Computational Problem Solving
Unit reference number	D/651/7207
Credits	12
Level	2
Type	Core

Guided Learning Hours	78	**Total Qualification Time**	120

Learning Outcomes: The Learner will be able to:	**Assessment Criteria:** The Learner can:
1. Describe and use the principles of computational thinking, including problem decomposition, pattern recognition, abstraction, and algorithm design.	1.1 Use decomposition to break down complex problems into smaller, manageable parts 1.2 Identify patterns, structures and behaviours in data. 1.3 Abstract key information from complex problem description. 1.4 Design algorithms to solve problems. 1.5 Represent algorithms using flowcharts and pseudocode. 1.6 Apply computational thinking to real-world problems.
2. Design, write, test and evaluate programs for well-defined and straightforward problems.	2.1 Write and run simple programs in a chosen programming language. 2.2 Use variables and select appropriate data types to store and manipulate data. 2.3 Implement control structures such as sequential, iteration, selection. 2.4 Create and use functions to modularise code for efficient code design. 2.5 Handle user input and display output effectively. 2.6 Identify and implement the base case and recursive case in simple recursive functions. 2.7 Systematically plan and execute tests for programs and correct errors. 2.8 Apply various debugging techniques to find and fix bugs. 2.9 Use basic data structures to organise data.

3. Understand and apply basic data structures in problem solving.	3.1 Explain the purpose and importance of different data structures. 3.2 Perform common operations on data structures. 3.3 Use records, arrays/lists, queues and stacks in the design of solutions to simple problems. 3.4 Choose the appropriate data structure for a given problem. 3.5 Analyse the efficiency of different data structures in terms of time and space complexity.
4. Understand basic algorithms and evaluate their efficiency using time and space complexity.	4.1 Discuss the important and characteristics of algorithms. 4.2 Design an algorithm to solve a well-defined and routine problem using different techniques. 4.3 Describe the performance of sorting algorithms and searching algorithms in terms of time and space complexity. 4.4 Write simple recursive algorithms to solve routine and well-defined problems. 4.5 Outline the concept of Big O notation and compare the efficiency of different algorithms based on their Big O notation.
5. Develop logical reasoning and understand of Boolean logic.	5.1 Apply Boolean logic in computation contexts. 5.2 Construct and interpret truth tables. 5.3 Simplify logical expressions using Boolean laws.
6. Understand and apply ethical considerations in computational problem solving.	6.1 Explain the role and significance of ethics in computational problem solving. 6.2 Identify and apply data privacy laws and regulations in a variety of well-defined contexts.. 6.3 Recognise sources of bias in algorithms and data sets and apply techniques to reduce bias.

Syllabus Content			
Topic No.	**Topic title**	**Proportion**	**Indicative Contents**
1.	Introduction to Computational Thinking	1/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. What is Computation Thinking?** • Definition of Computation Thinking: A method of solving problems using logical thinking. • Real-life examples: Planning a trip, solving a puzzle, organising a party. • Introduction to the four pillars of Computation Thinking. **2. Problem Decomposition** • Definition and importance of problem decomposition: Breaking down complex problems into smaller, more manageable parts. • Techniques for decomposing problems. • Structure diagram illustrating the decomposition process. • Examples and exercises on breaking down real-world problems.

			3. Pattern Recognition
			• Identifying patterns, structures and behaviours in data.
			• Understanding patterns and their significance in problem-solving.
			• Techniques for recognising patterns.
			• Practical examples and exercises on finding patterns in data.
			4. Abstraction
			• Definition and importance of abstraction: Simplifying complex problems by focusing on the main ideas and ignoring irrelevant details.
			• Create abstractions with functions, classes, objects, modules, packages etc.
			• Examples and exercises on abstracting problems.
			5. Algorithms Design
			• Introduction to algorithms and their role in computational thinking..
			6. AI and Computational Thinking
			• AI and how it relates to the 4 computational thinking pillars.
			• Examples: voice assistants (Siri, Alexa), recommendation systems (Netflix, YouTube), self-driving cars, chatbots.
			7. Real-World Applications
			• Applying computational thinking to solve real-world problems.
			  • Case studies of computational thinking in various fields (e.g., science, engineering, business).
			  • Group projects on solving real-world problems using computational thinking.
			  • Presentations and discussions on project outcomes.
			8. Practical Activities and Discussions
			• **Hands-On Exercises:** Practice problem decomposition, pattern recognition and abstraction through guided exercises.
			• **Group Projects:** Collaborate on projects that apply computational thinking to real-world problems**.**
			9. Assessment and Review
			• **Quizzes:** Test understanding of concepts and ability to apply them in different scenarios.
			Learning Outcome: 1

2.	Algorithms Design and Pseudocode	2/12
		
		Class Activities: 2 hrs x 2
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Introduction to Algorithms
			• Definition of an algorithm: A step-by-step set of instructions to solve a problem.
			• Everyday examples of algorithms (e.g., recipes, directions).
			• Characteristics of a good algorithm: clear, finite, effective.
			2. Representing Algorithms with Flowcharts
			• Flowchart symbols: Start/End, Process, Decision, Input/Output.
			• Flowchart rules: direction of flow, clarity, simplicity.
			3. Writing Algorithms in Pseudocode
			• What is pseudocode? Why use it?
			• Basic syntax: sequence, selection (if/else), repetition (loops).
			4. Tracing and Evaluating Algorithms
			• Dry run technique: tracing algorithms step-by-step.
			• Common errors in algorithms (logic errors, missing steps).
			• Introduction to algorithm efficiency (basic idea only).
			5. Activities and Discussion
			• **Class brainstorm:** What makes an algorithms good or bad?
			• **Write pseudocode for:**
			  • Calculating the average of 3 numbers.
			  • Checking if a number is even or odd.
			  • Covert the pseudocode into flowchart.
			6. Assessment and Review
			• **Quizzes:** Regular quizzes to test understanding of key concepts.
			
			Learning Outcome: 1

3.	Introduction to Programming (Python)	3/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Programming Basics** • Fundamental elements of programming. • Introduction to programming languages (e.g., Python, Java, C++). • High level vs low level programming **2. Python Overview:** • Why Python? (simplicity, readability, real-world use) • Real-world applications of Python (web, games, AI, automation) **3. Setting Up and Running Python**

			• Setting up and using an Integrated Development Environment (IDE) for coding. • Writing and running your first program (e.g., "Hello, World!"). **4. Python Syntax and Structure** • Indentation in Python • Comments in Python: single-line comments, multiple-line comments • Python keywords • Code readability: Use blank lines to separate sections, Use meaningful variable names, Keep lines short and clean. **5. Activities and Discussion** • **Demonstrations:** Introduce and explain key programming concepts with live coding examples. • **Hands-On Coding Exercises:** Practice writing, running, and debugging code through guided exercises. **6. Assessment and Review** • **Quizzes:** Test understanding of programming concepts and ability to apply them in different scenarios. ***Learning Outcome: 2***

4.	Introduction to Debugging	4/12
		
		Class Activities: 2 hrs x 2
		Practical: 2 hrs
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Understanding Bugs
			• Definition of bugs in software.
			• Common types of bugs: syntax errors, runtime errors, logic errors.
			2. Debugging Techniques
			• Various methods to identify and fix bugs:
			  • Manual code review and walkthroughs.
			  • Using print statements to trace code execution.
			  • Examples and exercises on applying these techniques to find and fix bugs.
			3. Understanding Program Flow – Trace Tables
			• What is a trace table?
			• Fill in a trace table for loops and conditionals.
			• Debug a logic error using a trace table.
			4. Using Debugging Tools
			• Introduction to integrated development environment (IDE) debugging tools.
			• Setting breakpoints and stepping through code.

			• Inspecting variables and the call stack. • Examples and exercises on using debugging tools in popular IDEs (e.g., Visual Studio Code, PyCharm). **5. Common Debugging Strategies** • Developing strategies to systematically approach debugging. • Reproducing the bug consistently. • Simplifying the problem by isolating code sections. • Checking assumptions and verifying expected behaviour. **6. Error Messages and Logs** • Understanding and interpreting compiler and runtime error messages. • Using logging frameworks to capture detailed information. • Examples and exercises on reading and interpreting error messages and logs. **7. Test Plan** • What is a test plan? • Designing test cases: normal, boundary, and invalid inputs. **8. Good Practices for Debugging** • Adopting best practices to improve debugging efficiency. • Keeping code simple and well-documented. • Writing clear and maintainable code. • Regularly testing and reviewing code. • Examples and exercises on implementing best practices in debugging. **9. Activities and Discussion** • **Hands-On Exercises:** Practice identifying and fixing bugs through guided exercises. • Use trace tables and test plans to guide debugging **10. Assessment and Review** • **Quizzes:** Test understanding of debugging concepts and ability to apply them in different scenarios. ***Learning Outcome: 2***
5.	Data Types and Variable	5/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr	**1. Introduction to Variables** • What is variable? • Purpose of variable in programming • Naming rules and conventions **2. Data Types Overview** • Common data types (integers, floats, strings, Booleans).

		Private study: 2 hrs	• Type conversion and casting. • Practical exercises on declaring and using variables. **3. Input and Output** • Input ( ) and print ( ) functions • String concatenation and formatting • Exercises on creating interactive programs. **4. Arithmetic and Assignment Operators** • Arithmetic operators: +, -, *, / • Assignment and Compound Assignment Operators: =, +=, -=, *=, /= **5. Practical Activities** • **Hands-On Exercises:** Practice declare variables, use input() and print() functions, and do simple math with guided exercises. **6. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 2***
6.	Control Structures	6/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Control Structures** • What is control structures? • Important of decision-making in programs **2. Basic if Statements** • Syntax of if in Python • Boolean expressions **3. if-else Statements** • Adding alternatives using else • Indentation and block structure **4. elif and Multiple Conditions** • Using elif for multiple branches • Logical operations: and, not **5. Nested Conditions** • Writing if statements inside other if blocks • When and why to use nesting **6. Loops – while and for** • What is a loop? • while loops and loop control (break, continue) • for loops with range ( ) • Looping though strings and lists **7. Practical Activities** • Examples and exercises on using control structures to solve problems. **8. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 2***

7.	Functions and Modular Programming	7/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Functions** • Definition of a function. • Benefits of using functions: code reuse, readability, and maintainability. • Examples of simple functions. **2. Function Definition and Invocation** • Syntax for defining a function. • Function parameters and return values. • Calling functions with and without parameters. • Examples and exercises on defining and invoking functions. **3. Scope and Lifetime of Variables** • Local vs. global variables. • Scope rules and how they affect variable accessibility. • Lifetime of variables and memory management. • Practical exercises on variable scope and lifetime. **4. Parameter Passing Techniques** • Pass-by-value vs. pass-by-reference. • Default parameters and keyword arguments. • Examples and exercises on different parameter passing techniques. **5. Modular Programming** • Definition and benefits of modular programming. • Creating and using modules. • Importing and using functions from modules. • Examples and exercises on modularising code. **6. Recursive Functions** • Definition and principles of recursion. • Base case and recursive case. • Examples of recursive functions (e.g., factorial, Fibonacci sequence). • Practical exercises on writing and debugging recursive functions. **7. Activities and Discussion:** • **Hands-On Coding Exercises:** Practice defining, invoking, and using functions through guided exercises. • **Projects:** Develop small projects that require the use of functions and modular programming techniques. **8. Assessment and Review**

			• **Quizzes:** Test understanding of function concepts and ability to apply them in different scenarios. ***Learning Outcome: 2.***
8.	Basic Data Structures	8/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Data Structures** • Definition and purpose of data structures. • Overview of different types of data structures. • Importance of choosing the right data structure for a problem. **2. Lists** • Definition of sequences in Python. • Mutable vs immutable sequences. • Creating lists, lists with mixed data types, and nested lists. • Accessing elements, indexing and slicing. ▪ Modifying lists and list operations. • Examples and exercises on using lists in Python. **3. Tuples** • Creating tuples, tuple packing and unpacking. • Accessing elements: indexing and slicing, iterating through tuples. • Immutability and benefits of immutability. • Creating and manipulating linked lists. • Examples and exercises on implementing tuples in Python. **4. Stacks - LIFO Concept** • Definition and properties of stacks. • Implementing stacks using arrays or linked lists. • Common operations: push, pop, peek, and isEmpty. • Examples and exercises on using stacks. **5. Queues- FIFO Concept** • Definition and properties of queues. • Implementing queues using arrays or linked lists. • Common operations: enqueue, dequeue, front, and isEmpty. • Examples and exercises on using queues. **6. Hands-On Coding Exercises:** Practice implementing and using various data structures through guided exercises. **7. Assessment and Review**

			• **Quizzes:** Test understanding of data structure concepts and ability to apply them in different scenarios. ***Learning Outcome: 3.***

9.	Searching and Sorting Algorithm	9/12
		
		Class Activities: 2 hrs x 2
		Practical: 2 hrs
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Introduction to Algorithms and Efficiency
			• Definition of an algorithm.
			• Concept of algorithm efficiency (basic idea of time complexity)
			• Real-world examples of searching and sorting
			2. Sorting Algorithms
			• Introduction to sorting and its importance.
			• Common sorting algorithms: bubble sort, selection sort, insertion sort, merge sort, quicksort.
			• Analysis of sorting algorithms in terms of time and space complexity.
			• Practical exercises on implementing and comparing sorting algorithms.
			3. Searching Algorithms
			• Introduction to searching and its applications.
			• Common searching algorithms: linear search, binary search.
			• Analysis of searching algorithms in terms of efficiency.
			• Practical exercises on implementing and using searching algorithms.
			4. Recursion
			• Definition and principles of recursion.
			• Base case and recursive case.
			• Examples of recursive algorithms (e.g., factorial, Fibonacci sequence).
			• Practical exercises on writing and debugging recursive functions.
			5. Algorithm Analysis
			• Introduction to algorithm analysis.
			• Big O notation and its significance.
			• Analysing the time and space complexity of algorithms.
			• Practical exercises on analysing and comparing the efficiency of different algorithms.
			6. Activities and Discussion:
			• **Hands-On Coding Exercises:**
			  • Given a sorted list of numbers, implement a binary search to find a target number.
			  • Create a list of 100 random numbers, search for a number using both linear and binary

			search. Count and compare the number of steps taken. **7. Assessment and Review** • **Quizzes:** Test understanding of algorithm concepts and ability to apply them in different scenarios. ***Learning Outcome: 4.***
10.	Basic File Handling	10/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to File Handling** • Definition and purpose of file handling. • Types of files (text files, binary files). • Common file operations (create, read, write, append, delete). **2. Opening and Closing Files** • Syntax for opening files in different modes (read, write, append). • Importance of closing files to free up resources. • Examples and exercises on opening and closing files. **3. Reading from Files** • Methods for reading files (read(), readline(), readlines()). • Reading entire files vs. reading line by line. • Handling large files efficiently. • Examples and exercises on reading data from files. **4. Writing to Files** • Methods for writing to files (write(), writelines()). • Writing data in different formats (text, binary). • Overwriting vs. appending data. • Examples and exercises on writing data to files. **5. File Modes and Permissions** • File modes (r, w, a, r+, w+, a+). • File permissions and access control. • Examples and exercises on using different file modes and setting permissions. **6. Working with Directories** • Creating, deleting, and navigating directories. • Handling relative and absolute file paths. • Examples and exercises on directory operations. **7. Error Handling in File Operations** • Common file handling errors (file not found, permission denied).

			• Using try-except blocks to handle errors. • Examples and exercises on error handling in file operations. **8. Best Practices for File Handling** • Ensuring data integrity and security. • Managing file resources efficiently. • Writing clean and maintainable file handling code. • Examples and exercises on implementing best practices. **9. Activities and Discussion** • **Hands-On Coding Exercises:** Practice file operations through guided exercises. **10. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 2***
11.	Introduction to Computational Logic and Boolean Algebra	11/12 Class Activities: 2 hrs x 2 Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Logic in Computing** • What is logic? • Logic in computing and everyday life • Boolean values: True, False **2. Logical Operators** • AND, OR, NOT operators • Constructing truth tables for each operators **3. Compound Logical Expressions** • Combining operators in expressions • Operators precedence and parentheses **4. De Morgan's Laws** • NOT (A AND B) = NOT A OR NOT B • NOT (A OR B) = NOT A AND NOT B • Simplifying logic expressions **5. Truth Tables and Decision Tables** • Constructing truth tables for program logic. • Using decision tables for structured problem solving. **6. Logic Circuits (Conceptual)** • Logic gates: AND, OR, NOT • Simple logic circuits and their Boolean equivalents. **7. Real-World Applications** • Logic in search engines, AI, electronics • Logic in filters, access control, automation. **8. Activities and Discussion:**

			• Truth table construction: Given basic Boolean expressions, fill in the truth tables. • Present a scenario, write the Boolean expression and draw a truth table. **9. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 5***
12.	Ethics in Computational Problem Solving	12/12 Class Activities: 2 hrs x 2 Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Ethics in Technology** • Definition of ethics and its relevance to technology. • Historical context and evolution of ethical considerations in technology. • Case studies highlighting ethical dilemmas in technology. **2. Data Privacy and Security** • Principles of data privacy and security. • Legal frameworks and regulations (e.g., GDPR, CCPA). • Best practices for data protection and encryption. • Examples and exercises on implementing data privacy measures. **3. Algorithmic Bias and Fairness** • Understanding algorithmic bias and its sources. • Impact of biased algorithms on society. • Techniques for detecting and reducing bias. • Examples and exercises on evaluating and improving algorithmic fairness. **4. Intellectual Property and Copyright** • Types of intellectual property (patents, copyrights, trademarks). • Legal implications of intellectual property infringement. • Best practices for using and sharing code and data. • Examples and exercises on navigating intellectual property issues. **5. Ethical Use of Artificial Intelligence** • Ethical considerations in AI development (transparency, accountability). • Potential risks and benefits of AI. • Guidelines and frameworks for ethical AI (e.g., AI Ethics Guidelines by the EU). • Examples and discussions on ethical AI applications. **6. Social Impact of Technology**

			• Positive and negative impacts of technology on society. • Digital divide and access to technology. • Ethical considerations in technology deployment (e.g., surveillance, automation). • Case studies on the social impact of technology. **7. Environmental Impact of Technology** • Environmental footprint of data centres and electronic waste. • Sustainable practices in technology development. • Examples of green computing initiatives. • Discussions on balancing technological advancement with environmental sustainability. **8. Future Trends and Ethical Challenges** • Future trends in technology and their potential ethical implications. • Preparing for ethical challenges in emerging fields (e.g., quantum computing, biotechnology). • Strategies for proactive ethical decision-making. • Discussions on the evolving landscape of ethics in technology. **9. Assessment and Review** • **Quizzes:** Test understanding of ethical concepts and ability to apply them in different scenarios. ***Learning Outcome: 6***

Assessment Type
• 30% Exam • 70% Assignment

References / Reading list
1. Beecher, K. (2018). *Computational thinking a beginner's guide to problem-solving and programming*. Swindon Bcs: British Computer Society, The Chartered Institute For It. 2. Anany Levitin and Levitin, M. (2011). *Algorithmic puzzles*. Oxford; New York: Oxford University Press. 3. Perugini, S. (2021). *Programming Languages: Concepts and Implementation*. Jones & Bartlett Learning. 4. Mailund, T. (2021). Introduction to computational thinking: problem solving, algorithms, data structures, and more. New York: Apress.

Mapping of ILO's

Topic / ILO	1	2	3	4	5	6
1. Introduction to Computational Thinking	X					
2. Algorithms Design and Pseudocode	X					
3. Introduction to Programming (Python)		X				
4. Introduction to Debugging 5. Data Types and Variable		X				
6. Control Structures		X				
7. Functions and Modular Programming		X				
8. Basic Data Structures			X			
9. Searching and Sorting Algorithm				X		
10. Basic File Handling		X				
11. Introduction to Computation Logic and Boolean Algebra					X	
12. Ethics in Computational Problem Solving						X

2. Computer Systems and Networking

Unit Overview

This unit provides a comprehensive introduction to key areas in computing and networking. It covers the basics of computer systems, data representation and storage, and operating systems, along with essential hardware maintenance.

Learners will explore cloud computing, emerging technologies in computing, and gain foundational knowledge in networking, including network protocols, models, configuration, and troubleshooting. The unit also delves into wireless networking, basic programming for networking, and the latest advancements in networking technologies, equipping students with the skills needed for further education or entry-level IT roles.

Title	**Computer Systems and Networking**
Unit reference number	F/651/7208
Credits	12
Level	2
Type	Core

Guided Learning Hours	76 hours	**Total Qualification Time**	120 hours

Learning Outcomes: The Learner will:	**Assessment Criteria:** The Learner can:
1. Understand the core components and functions of computer systems, including how hardware, software, and networks work together to enable effective performance and communication.	1.1 Identify and describe the functions of the hardware components and how these components interact within a computer system. 1.2 Explain how data is entered into and retrieved from a computer system and the processes involved in input and output operations. 1.3 Explain how numerical, graphical, sound and character data are represented in a digital computer system. 1.4 Understand binary, denary and hexadecimal number representation, convert numbers between each system and perform simple arithmetic. 1.5 Calculate storage requirements for specified data. Understand the units of information (bit, byte) and the names, symbols and corresponding values for the decimal prefixes (k, M, G, T, P). 1.6 Identify factors that affect the performance of a computer system, such as CPU speed, memory, cache, and storage and understand the importance of benchmarking in assessing system performance. 1.7 Differentiate between system software and application software and describe the roles of operating systems and utility programs. 1.8 Apply Practical Skills such as identify and label hardware components in a computer system, install and configure software applications and operating systems, and perform

	simple troubleshooting for common hardware and software issues.
2. Develop practical problem-solving skills in managing and troubleshooting computer systems, storage, and networks, with an emphasis on operating systems and network protocols.	2.1 Identify basic hardware issues like loose cables, unresponsive devices, and overheating. Perform simple repairs, such as reconnecting cables and cleaning dust from components. 2.2 Perform hands-on configuration and troubleshooting of network devices. 2.3 Identify and diagnose common network issues. 2.4 Apply systematic troubleshooting methodologies to diagnose and resolve common network issues across physical, data link, and network layers using appropriate tools and techniques.
3. Understand the types of networks, protocols, models, data transmission, addressing and recognise basic security measures to protect these systems.	3.1 Describe different types of networks (LAN, WAN, MAN, PAN) and their characteristics and explain the functions of basic networking devices including routers, switches, and hubs. 3.2 Define what a network protocol is and explain its importance in networking. 3.2 Describe the layers of the OSI and TCP/IP models and explain the functions of each layer and how they interact. 3.3 Explain the roles of protocols such as HTTP, FTP, SMTP, TCP, UDP, and IP and how these protocols facilitate communication over networks. 3.4 Explain the principles of IP addressing, routing and DNS. 3.5 Identify and mitigate security and performance issues in modern networks.
4. Demonstrate an understanding of network security by identifying common cyber threats and vulnerabilities, selecting appropriate security tools and practices, and applying ethical and legal principles to safeguard digital systems and data.	4.1 Define what network security is and explain its purpose. 4.2 Identify and categorise common types of cyber threats e.g., malware, phishing, DoS). 4.3 Describe the functions of firewalls, antivirus software, and encryption. 4.4 Compare and contrast MFA and FIDO passkeys as authentication methods. 4.5 Define what a vulnerability is and identify common examples (e.g., outdated software, open ports). 4.6 Propose mitigation strategies such as patching, MFA, firewalls, and user education. 4.7 Discuss ethical considerations in network security and understand the legal responsibilities of individuals and organisations in protecting data.
5. Explore how emerging technologies, such as IoT, AI, 5G, and blockchain, are shaping the future of computing and networking, and how they may drive innovation and change in the industry.	5.1 Explain the basic concepts and applications of technologies like Artificial Intelligence (AI), Internet of Things (IoT), and blockchain. 5.2. Discuss the potential future developments and trends in computing. 5.3. Analyse the ethical and societal implications of emerging technologies. 5.4 Explain the principles, benefits, issues and challenges of emerging networking technologies. 5.5 Analyse how emerging technologies could influence network architecture and operations.
6. Understand the concept of operating systems,	6.1 Describe the primary functions of an operating system and explain how it manages hardware and software resources.

including their purpose, functions, components, and management of processes, memory, files, devices, and security.	6.2 Identify and explain the structure and components of an operating system, including the roles of the kernel, system libraries, and user interfaces. 6.3 Define and explain multitasking, process scheduling algorithms (e.g., round-robin, priority scheduling), and context switching. 6.4 Describe how operating systems manage memory, including concepts such as virtual memory and paging. 6.5 Explain how operating systems manage files and directories and understand file system structures and storage management techniques. 6.6 Explain the security features provided by operating systems, including user authentication, access control, and encryption. 6.7 Describe methods of user authentication (e.g., passwords, passkeys, biometrics) and access control models (e.g., DAC, MAC, RBAC).

Syllabus Content			
Topic No.	**Topic title**	**Proportion**	**Indicative Content**
1	Introduction to Computer Systems	1/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Overview of Computer System** • **Definition and Purpose**: Explain what a computer system is and its primary functions. • **Historical Context**: Brief history of computer development from early machines to modern computers. **2. Hardware Components** **Central Processing Unit (CPU)**: • **Function**: Describe the role of the CPU in executing instructions. • **Components**: Explain the parts of the CPU (ALU, control unit, registers). • **Fetch-Decode-Execute (FDE)** cycle: Overview of how instructions are processed **Memory**: • **Types**: Differentiate between RAM (volatile) and ROM (non-volatile). • **Function**: Explain how memory stores data and instructions. **Storage Devices**: • **Types**: Compare different storage devices (HDD, SSD, optical drives). • **Function**: Explain how data is stored and retrieved. **Input Devices**: • **Examples**: Keyboard, mouse, scanner.

			• **Function**: Describe how input devices allow users to interact with the computer. **Output Devices**: • **Examples**: Monitor, printer, speakers. • **Function**: Explain how output devices present information to users. **3. Software Components** **System Software**: • **Operating Systems**: Describe the role of operating systems (Windows, macOS, Linux, Android, iOS, and server OS). • **Utility Programs**: Explain the purpose of utility programs (antivirus, file management). **Application Software**: • **Types**: Differentiate between various types of application software (word processors, spreadsheets, web browsers). • **Function**: Explain how application software helps users perform specific tasks. **4. Basic Input/Output Operations** **Input Operations**: • **Process**: Describe how data is entered into the computer system. • **Examples**: Typing on a keyboard, clicking a mouse. **Output Operations**: • **Process**: Explain how data is processed and presented to the user. • **Examples**: Displaying text on a screen, printing a document. **5. Computer System Performance** **Factors Affecting Performance**: • **CPU Speed**: Explain how clock speed and cores affect performance. • **Memory**: Discuss the impact of RAM size and speed. • **Cache**: Explain how cache acts as a high-speed intermediary between the CPU and the RAM. • **Storage**: Compare the performance of different storage types (HDD vs. SSD). **Benchmarking**: Introduce the concept of benchmarking and its importance in evaluating performance. **6. Practical Activities** • **Hardware Identification**: Hands-on activity to identify and label different hardware components.

			• **Software Installation**: Practice installing and configuring basic software applications and operating system • **Basic Troubleshooting**: Introduce simple troubleshooting techniques for common hardware and software issues. **7. Assessment and Review** • **Quizzes**: Quizzes to test understanding of key concepts. • **Class Discussions**: Encourage discussions to reinforce learning and address any questions. ***Learning Outcome: 1***

2	Data Representation and Storage	2/12
		
		Class Activities: 2 hrs x 2
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Introduction to Data Representation
			• **Binary System:**
			  • Basics of binary numbers.
			  • Converting between binary and decimal.
			  • Binary arithmetic (addition, subtraction, Negative Numbers and Two's Complement).
			• **Hexadecimal System:**
			  • Basics of hexadecimal numbers.
			  • Converting between hexadecimal and binary/decimal.
			  • Uses of hexadecimal in computing (e.g., memory addresses).
			• **Images and Graphics:**
			  • Pixel and Resolution
			  • Colour Representation (RGB model, Bit depth, grayscale images)
			  • Image file formats (Bitmap, JPEG, PNG, GIF)
			• **Sound:**
			  • Analog vs digital
			  • Bit Depth
			  • File formats: WAV, MP3, FLAC
			2.Character Encoding
			• **ASCII:**
			  • Definition and purpose.
			  • ASCII table and common characters.
			• **Unicode:**
			  • Need for Unicode.
			  • Differences between ASCII and Unicode.
			  • Examples of Unicode characters.
			3. Data Measurement Units
			• **Bits and Bytes:**
			  • Definition of a bit and a byte.
			  • Relationship between bits and bytes.
			• **Data Units:**

			• Kilobyte (KB), Megabyte (MB), Gigabyte (GB), Terabyte (TB), Petabyte (PT). • KB vs kB: What's the Difference? • Converting between different data units. • Practical examples of data sizes (e.g., file sizes, storage capacities). **4. Types of Data Storage** • **Primary Storage:** • RAM (Random Access Memory): Characteristics and uses. • ROM (Read-Only Memory): Characteristics and uses. • **Secondary Storage: Selecting and justifying suitable media** • Hard Disk Drives (HDD): Structure and function. • Solid State Drives (SSD): Structure and function. • Optical Storage: CDs, DVDs, Blu-ray discs. • Flash Storage: USB drives, memory cards. **5. Volatile vs. Non-Volatile Storage** • **Volatile Storage:** • Definition and examples (e.g., RAM). • Characteristics and typical uses. • **Non-Volatile Storage:** • Definition and examples (e.g., HDD, SSD). • Characteristics and typical uses. **6. Data Storage Calculations** • **File Size Calculation:** • Calculating the size of text files, images, and audio files. • Understanding compression (Lossy and lossless) and its impact on file size and quality. • **Storage Capacity Planning:** • Estimating storage needs for different applications. • Practical exercises in calculating storage requirements. **7. Activities** • **Binary and Hexadecimal Conversion Exercises:** • Practice converting numbers between binary, decimal, and hexadecimal. • **Character Encoding Activities:** • Using ASCII and Unicode tables to encode and decode text.

			• **Data Measurement and Storage Calculations:**
			  • Exercises in calculating file sizes and converting between data units.
			• **Hands-On Storage Device Exploration:**
			  • Identifying and comparing different storage devices.
			  • Exploring the internals of a hard drive or SSD.
			8. Assessment and Review
			• **Quizzes:**
			  • Regular quizzes to test understanding of key concepts.
			• **Projects:**
			  • Assign projects that involve practical applications of data representation and storage.
			• **Class Discussions:**
			  • Encourage discussions to reinforce learning and address any questions.
			
			Learning Outcome: 1

3	Computer Hardware and Maintenance	3/12
		
		Class Activities: 2 hrs x 2
		Practical: 2 hrs
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Introduction to Computer Hardware
			• **Overview of Hardware Components:**
			  • Motherboard: Functions and types.
			  • Central Processing Unit (CPU): Architecture, instruction set (RISC and CISC), types, and performance factors.
			  • Memory: Types (RAM, ROM), functions, and differences.
			  • Storage Devices: HDD, SSD, optical drives, and their characteristics.
			  • Power Supply Unit (PSU): Importance and specifications.
			  • Peripheral Devices: Keyboards, mice, printers, scanners, monitors.
			2. Hardware Installation and Configuration
			• **Installing and Configuring Hardware:**
			  • Steps to install a new hardware component.
			  • Driver installation and updates.
			  • Configuring peripheral devices.
			3. Preventative Maintenance
			• **Routine Maintenance Procedures:**
			  • Cleaning internal components (dust removal, thermal paste application).
			  • Checking and securing connections.

			• Updating firmware and drivers. • Regular backups and data protection. **4. Troubleshooting Hardware Issues** • **Common Hardware Problems and Solutions:** • Diagnosing issues with the motherboard, CPU, memory, and storage. • Power supply problems and solutions. • Peripheral device troubleshooting. • Using diagnostic tools and software. **5. Upgrading Hardware and Software Components** • **Upgrading and Replacing Components:** • Identifying upgrade needs (slow boot times, performance bottlenecks, compatibility, hardware fault and failure, routine maintenance). • Evaluating compatibility issues with current hardware and software. • Preparing for upgrade: full data and system backup, system documentation. • Steps to upgrade RAM, storage, and graphics cards. • Replacing faulty components (PSU, motherboard, CPU). • Ensuring compatibility and performance improvements. • **Post-Upgrade Testing and Validation** • Verifying system stability and compatibility. • Ensuring all updates are properly installed and configured. • Backup verification. **6. Safety and Good Practices** • **Safety Precautions:** • Electrostatic discharge (ESD) prevention. • Safe handling of components. • Proper use of tools and equipment. • Environmental considerations (disposal of electronic waste). **7. Hands-On Practice and Labs**

			• **Practical Sessions:**
			  • Assembling a computer's parts.
			  • Components matching game: Provide a list of components and their functions. Students must match each component to its correct function.
			  • Performing hardware upgrades.
			8. Assessment and Review
			• **Quizzes:**
			  • Regular quizzes to test understanding of key concepts.
			
			Learning Outcome: 2

4	Operating System	4/12
		
		Class Activities: 2 hrs x 2
		Practical: 2 hrs
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Operating Systems
			• Functions of an OS: Managing hardware, software resources, and providing common services.
			• Popular Operating Systems: Overview of Windows, macOS, Linux, and mobile OS like Android and iOS.
			• Basic Commands: Introduction to command-line interfaces and basic commands.
			2. Components of an Operating System
			• Kernel:
			  • Definition and functions of the kernel.
			• System Libraries:
			  • Role of system libraries in providing functionality.
			  • Examples of common system libraries.
			• User Interface:
			  • Command-line interfaces (CLI) vs. graphical user interfaces (GUI).
			  • Examples of popular user interfaces (e.g., Windows, macOS, Linux).
			3. Process Management and Scheduling
			• Understanding Processes
			  • Definition of a process vs. a program
			  • Process states: New, Ready, Running, Waiting, Terminated
			  • Process Control Block (PCB) and its components
			• Scheduling objectives (efficiency, fairness, response time)
			• Types of schedulers: long-term, short-term, and medium-term

			• Scheduling algorithms:
			  • First-Come, First-Served (FCFS)
			  • Shortest Job Next (SJN)
			  • Round Robin (RR)
			  • Priority Scheduling
			4. Memory Management
			• Memory Hierarchy:
			  • Overview of memory types (RAM, cache, virtual memory).
			  • Importance of memory hierarchy in performance.
			• Virtual Memory:
			  • Concept of virtual memory and its benefits.
			  • Techniques like paging
			• Memory Allocation:
			  • Methods of memory allocation (fixed, dynamic).
			  • Memory fragmentation and solutions.
			5. File Systems and Storage Management
			• File System Structure:
			  • Components of a file system (files, directories, metadata).
			  • Common file systems (FAT, NTFS, ext4).
			• File Operations:
			  • Basic file operations (create, read, write, delete).
			  • File permissions and access control.
			• Storage Management:
			  • Types of storage devices (HDD, SSD, optical).
			  • Techniques for managing storage space.
			6. Security and Protection
			• User Authentication:
			  • Methods of user authentication (passwords, biometrics).
			  • Importance of secure authentication.
			• Access Control:
			  • Types of access control (discretionary, mandatory).
			  • Role of access control lists (ACLs).
			• Data Protection:
			  • Techniques for protecting data (encryption, backups).
			  • Importance of data integrity and confidentiality.
			7. Practical Activities

			• Hands-On Labs:
			  • Setting up and configuring an operating system.
			  • Exploring system settings and configurations.
			• Process and Memory Management Exercises:
			  • Simulating process scheduling and memory allocation.
			• File System Operations:
			  • Performing file operations and managing permissions.
			8. Assessment and Review
			• Quizzes:
			  • Regular quizzes to test understanding of key concepts.
			• Projects:
			  • Assign projects that involve configuring and managing an operating system.
			• Class Discussions:
			  • Encourage discussions to reinforce learning and address any questions.
			
			Learning Outcome: 2, 6

5	Emerging Technologies in Computing	6/12
		
		Class Activities: 2 hrs x 2
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Introduction to Emerging Technologies
			• **Overview of Emerging Technologies:**
			  ○ Definition and significance.
			  ○ Historical context and evolution.
			  ○ Current trends and future outlook.
			2. Artificial Intelligence (AI)
			• **Basics of AI:**
			  ○ Definition and types (narrow AI, general AI, superintelligent AI).
			  ○ Key concepts (machine learning, deep learning, neural networks).
			  ○ Applications of AI (natural language processing, computer vision, robotics).
			• **Generative AI and Large Language Models (LLMs)**
			  ○ What are LLMs? (e.g., ChatGPT, Gemini)
			  ○ What is Generative AI? Types of generative models (text, image, audio, code)
			  ○ LM vs. Generative AI
			• **Chatbots and Conversational AI**
			  ○ Rule-based vs. AI-powered chatbots.
			  ○ Use cases in business, education, and healthcare.

			• **Ethical Considerations:**
			  ○ Bias and fairness in AI.
			  ○ Privacy concerns.
			  ○ Impact on employment and society.
			3. Quantum Computing
			• **Basics of Quantum Computing:**
			  • Quantum bits (qubits) and quantum gates.
			  • Quantum algorithms (Shor's algorithm, Grover's algorithm).
			  • Potential applications (cryptography, optimisation, drug discovery).
			2. **Current State and Future Prospects:**
			  • Current advancements and limitations.
			  • Future research directions and potential breakthroughs.
			4. Augmented Reality (AR) and Virtual Reality (VR)
			• **Introduction to AR and VR:**
			  • Definitions and differences between AR and VR.
			  • Hardware and software components.
			  • Applications (gaming, education, training, healthcare).
			• **Development and Implementation:**
			  • Tools and platforms for AR/VR development.
			  • User experience design.
			  • Challenges and future trends.
			5. Cybersecurity in Emerging Technologies
			• **Security Challenges:**
			  • Threats and vulnerabilities in AI, IoT, blockchain, and other emerging technologies.
			  • Strategies for securing emerging technologies.
			  • Role of cybersecurity in the development and deployment of new technologies.
			6. Ethical and Societal Implications
			• **Ethical Considerations:**
			  • Ethical frameworks for emerging technologies.
			  • Balancing innovation with ethical responsibility.
			  • Case studies of ethical dilemmas in emerging technologies.

			• **Societal Impact:**
			  • Impact on employment and the economy.
			  • Social and cultural implications.
			  • Policy and regulatory considerations.
			7. Future Trends and Predictions
			• **Exploring Future Trends:**
			  • Predictions for the next decade in computing.
			  • Potential disruptive technologies.
			  • Preparing for future advancements.
			8. Case Studies
			• Analysis of real-world implementations of emerging technologies.
			• Lessons learned and good practices.
			9. Assessment and Review
			• **Quizzes:**
			  • Regular quizzes to test understanding of key concepts.
			
			Learning Outcome: 5

6	Introduction to Networking	7/12
		
		Class Activities: 2 hrs x 2
		Practical: 2 hrs
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Introduction to Networking
			• **Definition and Purpose**:
			  • What is a network?
			  • Importance of networks in organisations.
			• **Network Architecture**
			  • P2P
			  • Client Server
			  • Hybrid
			• **Types of Networks**:
			  • Local Area Network (LAN)
			  • Wide Area Network (WAN)
			  • Metropolitan Area Network (MAN)
			  • Personal Area Network (PAN)
			2. Network Topologies
			• **Star Topology**:
			  • Structure and function.
			  • Advantages and disadvantages.
			• **Mesh Topology**:
			  • Structure and function.
			  • Advantages and disadvantages.
			• **Hybrid Topology**:
			  • Combining different topologies.
			  • Use cases and benefits.
			• **Bus Topology (phasing out)**:
			  • Structure and function.
			  • Advantages and disadvantages.
			• **Ring Topology (phasing out)**:
			  • Structure and function.
			  • Advantages and disadvantages.

			3. Network Hardware
			• **NICs:** Function and types
			• **Routers**:
			  • Function and importance.
			  • Basic configuration.
			• **Switches**:
			  • Function and importance.
			  • Differences between switches and hubs.
			• **Modems**:
			  ○ Function and types (DSL, cable).
			• **Wireless Access Points (WAPs)**:
			  ○ Function and setup.
			• **Firewalls**:
			  ○ Purpose and basic configuration.
			• **Hubs and Bridges (Legacy Devices)**:
			  ○ Function and limitations.
			4. Network Configuration and Troubleshooting
			• **Basic Network Setup**:
			  • Configuring a simple LAN.
			  • Setting up routers and switches.
			• **Troubleshooting Tools**:
			  • Using ping and traceroute.
			  • Identifying and resolving common network issues.
			5. Practical Activities
			• **Hands-On Labs (simulators)**:
			  • Setting up and configuring a small network.
			  • Exploring network topologies through simulations.
			6. Assessment and Review
			• **Quizzes**:
			  • Regular quizzes to test understanding of key concepts.
			• **Projects**:
			  • Assign projects that involve designing and configuring a network.
			• **Class Discussions**:
			  • Encourage discussions to reinforce learning and address any questions.
			
			Learning Outcome: 3

7	Network Protocols and Models	7/12
		
		Class Activities: 2 hrs x 2
		Practical: 2 hrs
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Introduction to Network Protocols
			• **Definition and Importance**:
			  • What is a network protocol?
			  • The role of protocols in ensuring reliable and efficient communication.
			2. The OSI Model
			• **Overview of the OSI Model**:
			  • Purpose and structure of the OSI model.

			• The seven layers: Physical, Data Link, Network, Transport, Session, Presentation, Application. **3. The TCP/IP Model** • **Overview of the TCP/IP Model**: • Comparison with the OSI model. • The four layers: Link, Internet, Transport, Application. • **Functions of Each Layer**: • Detailed explanation of the functions and protocols associated with each layer. • Examples of protocols at each layer (e.g., TCP at the Transport layer, HTTP at the Application layer). **4. Key Network Protocols** • **HTTP and HTTPS**: • Purpose and function of HTTP and HTTPS. • Differences between HTTP and HTTPS. • **FTP and SFTP**: • Purpose and function of FTP and SFTP. • Use cases for file transfer protocols. • **SMTP and IMAP**: • Purpose and function of SMTP and IMAP. • How these protocols facilitate email communication. • **TCP and UDP**: • Differences between TCP and UDP. • Use cases for each protocol (e.g., TCP for reliable communication, UDP for faster, less reliable communication). • **IP (IPv4 and IPv6)**: • Structure and function of IP addresses. • IPv4 limitations • Differences between IPv4 and IPv6. • **DNS** • Definition and purpose of DNS. • How DNS translates domain names to IP addresses. **5. Packet Switching and Data Transmission** • **Concept of Packet Switching**: • Definition and importance of packet switching. • How data is divided into packets and transmitted across networks. • **Data Transmission**:

			• Steps involved in data transmission (encapsulation, transmission, decapsulation). • Role of routers and switches in directing data packets. **6. Practical Activities** • **Hands-On Labs**: • Configuring network devices and protocols. • Setting up a simple network using different protocols: • IP - Assigning IPs to devices • TCP: File transfers, web browsing • UDP: Streaming, VoIP • HTTP/HTTPS: Accessing websites • FTP/SFTP: Uploading/downloading files **7. Assessment and Review** • **Quizzes**: Regular quizzes to test understanding of key concepts. • **Class Discussions**: Encourage discussions to reinforce learning and address any questions. ***Learning Outcome: 3***
8	Network Configuration and Troubleshooting	8/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Network Configuration** • **Network Devices:** • Overview of routers, switches, hubs, and access points. • Basic configuration of network devices. • **IP Addressing:** • Static vs. dynamic IP addressing. **2. Network Configuration Tools** • **Command Line Interfaces (CLI):** • Using CLI for network device configuration. • Common CLI commands for routers and switches. • **Graphical User Interfaces (GUI):** • Configuring network devices using web-based GUIs. • Advantages and limitations of GUI-based configuration. • **Network Management Software:** • Overview of network management tools • Features and benefits of using network management software. **3. Basic Network Troubleshooting** • **Troubleshooting Methodologies:**

			• Step-by-step approach to troubleshooting network issues. • Common troubleshooting models (e.g., OSI model-based troubleshooting). • **Troubleshooting Tools:** • Ping and traceroute for connectivity testing. • Network analysers (e.g., Wireshark) for packet analysis. • Using logs and diagnostic tools on network devices. • **Common Network Issues:** • Identifying and resolving IP conflicts. • Troubleshooting connectivity issues. • Diagnosing and fixing performance problems. **4. Network Security Configuration** • **Firewalls:** • Configuring and managing firewalls. • Types of firewalls (hardware, software). • **Access Control:** • Implementing access control lists (ACLs). • Role-based access control (RBAC) in network security. **5. Practical Activities** • **Hands-On Labs:** • Configuring network devices in a lab environment. • **Troubleshooting Scenarios:** • Simulated network issues for students to diagnose and resolve. • Using troubleshooting tools to identify and fix problems. **Layer 1 Troubleshooting:** • Physical layer issues (cabling, connectors, signal interference). • Tools for diagnosing physical layer problems (cable testers, multimeters). **Layer 2 Troubleshooting:** • Data link layer issues (MAC address conflicts). • Tools and techniques for resolving Layer 2 issues. **Layer 3 Troubleshooting:** • Network layer issues (routing problems, IP addressing conflicts). • Check connectivity with ping command and traceroute. • **Security Configuration Exercises:**

			• Configuring firewalls • Implementing access control measures. **6. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. • **Projects:** Assign projects that involve configuring and troubleshooting a network. • **Class Discussions:** Encourage discussions to reinforce learning and address any questions. ***Learning Outcome: 2***
9	Wireless Networking	9/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Wireless Networking** • Overview of wireless communication technologies • History and evolution of wireless networks • Applications of wireless networks **2. Wireless Communication Fundamentals** • Radio frequency (RF) spectrum • Signal propagation and fading • Antennas and propagation models • Bandwidth, latency, and interference • Line-of-sight and non-line-of-sight communication **3. Types of wireless networks:** • WLAN (Wi-Fi) • WPAN (Bluetooth) • WWAN (Cellular) • WMAN (WiMAX) **4. Wi-Fi Standards and Technologies** • IEEE 802.11 standards (a/b/g/n/ac/ax) • Frequency bands: 2.4 GHz vs. 5 GHz • Wi-Fi 6 and Wi-Fi 7 overview **5. Wireless Network Security** • Common threats and vulnerabilities in wireless networks • Security protocols and good practices • Implementing security in WLANs • Case studies of wireless network security breaches **6. Practical Labs** • Setting up a WLAN using a wireless router and access points. • Configuring security settings for a WLAN • Monitoring WLAN signals/ channels etc **7. Assessment and Review**

			• **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 3***
10	Cloud Computing Basics	10/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Cloud Computing** • Definition and characteristics of cloud computing • History and evolution of cloud computing • Benefits and challenges of cloud computing **2. Cloud Service Models** • Overview of IaaS, PaaS, and SaaS • Key features and use cases of each service model • Examples of popular services (e.g., AWS EC2, Google App Engine, Microsoft Office 365) **3. Cloud Deployment Models** • Public cloud: Characteristics, advantages, and providers • Private cloud: Characteristics, advantages, and implementation • Hybrid cloud: Integration of public and private clouds • Multi-cloud strategies and considerations **4. Cloud Computing Platforms** • Overview of major cloud platforms (AWS, Azure, Google Cloud) • Core services offered by each platform **5. Cloud Security and Compliance** • Common security threats and vulnerabilities in the cloud • Security best practices and tools (encryption, identity management) • Compliance standards (GDPR, HIPAA, PCI-DSS) **6. Practical Labs** • Deploying a web application on a cloud platform • Configuring cloud storage Implementing security measures for a cloud environment **7. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome:3, 5***
11	Network Security	11/12	**1. Introduction to Network Security** • What is network security?

		Class Activities: 2 hrs x 2
		Quizzes: 1 hr
		Private study: 2 hrs
			• Why it matters: real-world examples (e.g., data breaches, cyberattacks)
			• Types of threats: malware, phishing, hacking, denial of service (DoS)
			2. Types of Cyber Threats
			• Malware: viruses, worms, trojans, ransomware
			• Social engineering: phishing, baiting, pretexting
			• Insider threats and human error
			3. Security Measures and Tools
			• Firewalls, antivirus software, encryption techniques.
			• Secure passwords, multi-factor authentication (MFA), FIFO passkey.
			• Network segmentation and access control
			4. Vulnerabilities, Risks, and Mitigation
			• What is a vulnerability? (e.g., outdated software, weak passwords, open ports)
			• Types of risks:
			  • Unauthorised access
			  • Data theft
			  • Service disruption (e.g., DDoS attacks)
			  • Common vulnerabilities:
			  • Software bugs
			  • Misconfigured systems
			  • Human error (e.g., clicking phishing links)
			• Mitigation Strategies:
			  • Regular software updates and patches
			  • Strong password policies and multi-factor authentication
			  • Firewalls and antivirus software
			  • User education and awareness
			5. Ethical and Legal Aspects
			• Security considerations in network automation
			• Implementing secure coding practices
			• Using scripts to enhance network security (e.g., automated vulnerability scans)
			6. Assessment and Review
			• **Quizzes:** Quizzes to test understanding of key concepts.
			• **Projects:** Assign projects that investigating real cyber security breach.
			• **Class Discussions:** Encourage discussions to reinforce learning and address any questions.
			Learning Outcome: 4

12	Emerging Technologies in Networking	12/12 Class Activities: 2 hrs x 2 Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Emerging Networking Technologies** • Overview of current trends and innovations in networking • Importance of staying updated with emerging technologies • Impact of emerging technologies on various industries **2. Software-Defined Networking (SDN)** • Principles and architecture of SDN • Benefits and challenges of SDN • Use cases and applications of SDN **3. Network Function Virtualisation (NFV)** • Introduction to NFV and its components • Benefits and challenges of NFV • Implementing NFV in modern networks **4. 5G and Beyond** • Overview of 5G technology and its advancements • Key features (features (high speed, low latency, massive connectivity) and benefits of 5G. • Use cases and applications of 5G (smart cities, autonomous vehicles, remote surgery). • Future trends in mobile networking (6G and beyond) **5. Internet of Things (IoT) Networking** • Introduction to IoT and its components (sensors, actuators, connectivity). • IoT communication protocols and standards. • Applications of IoT (smart homes, healthcare, industrial IoT). • Challenges in IoT networking (scalability, security, privacy, interoperability) **6. Edge Computing and Networking** • Principles of edge computing • Benefits and challenges of edge networking • Use cases and applications of edge computing • Advantages and Challenges**:** Reduced latency and bandwidth usage, Security and privacy concerns, Integration with existing infrastructure. **7. Blockchain Technology** • Definition and key concepts (distributed ledger, consensus mechanisms). • Types of blockchains (public, private, consortium).

			• Applications of blockchain (cryptocurrencies, supply chain management, smart contracts, anti-money laundering & crime tracking). • Benefits and Challenges: Security and transparency, Scalability and energy consumption, Regulatory and legal considerations. **8. Artificial Intelligence in Networking** • Role of AI and machine learning in networking • AI-driven network management and automation • Use cases of AI in network security and optimisation **9. Cloud Networking** • Overview of cloud networking concepts • Cloud-native networking technologies • Integrating cloud services with traditional networks **10. Security in Emerging Networking Technologies** • Security challenges in modern networks • Implementing security measures for SDN, NFV, IoT, and 5G • Case studies of security breaches and mitigation strategies **11. Future Trends in Networking** • Exploration of upcoming networking technologies • Potential impact on industries and society • Preparing for future advancements in networking **12. Assessment and Review** **Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 5***

Assessment Type
• 30% Exam • 70% Assignment

References / Reading list
1. Dale, N. and Lewis, J. (2019) Computer Science Illuminated, 7th ed. Jones and Bartlett Publishers, Inc. 2. Manvi, S. and Shyam, G.K. (2021) Cloud Computing: Concepts and technologies. 1st ed. CRC Press. 3. Lowe, D. (2025) *Networking all-in-one*. Hoboken, NJ: John Wiley & Sons, Inc. 4. Hare, K. and Van Arman, P. (2022) *Computer science principles: The foundational concepts of computer science*. Atlanta, GA: Yellow Dart Publishing.

Mapping of ILOs

Topic / ILO	1	2	3	4	5	6
1. Introduction to Computer Systems	×					
2. Data Representation and Storage	×					
3. Computer Hardware and Maintenance		×				
4. Operating Systems		×				×
5. Emerging Technologies in Computing					×	
6. Introduction to Networking			×			
7. Network Protocols and Models			×			
8. Network Configuration and Troubleshooting		×				
9. Wireless Networking			×			
10. Cloud Computing Basics			×		×	
11. Network Security				×		
12. Emerging Technologies in Networking					×	

3. Cloud Computing

Unit overview

This unit introduces students to the fundamental concepts and definitions of cloud computing, exploring its growing significance in business operations and technical infrastructure. Students will examine the economic, strategic, and technological drivers behind cloud adoption, gaining insight into how cloud computing supports innovation, scalability, and digital transformation across industries.

It covers various types of cloud services and deployment models. Students will learn about cloud service models such as IaaS, PaaS, and SaaS, and understand their key features and use cases. This unit also covers cloud deployment models, cloud architecture and design principles, and security measures. Students will gain practical knowledge in cloud storage, databases, and the role of automation in cloud environments.

The unit addresses cloud cost management, migration processes, and effective monitoring and management. Students will explore on emerging trends and innovations in cloud computing, equipping them for future of cloud computing as part of the broader digital ecosystem.

Title	Cloud Computing
Unit reference number	H/651/7209
Credits	12
Level	2
Type	Core

Guided Learning Hours	72	**Total Qualification Time**	120

Learning Outcomes: The Learner will:	**Assessment Criteria:** The Learner can:
1. Understand the key characteristics, benefits and evolving developments in cloud computing.	1.1 List and describe various cloud computing characteristics. 1.2 Evaluate the benefits of cloud computing in a variety of well-defined scenarios. 1.3 Define Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). 1.4 Provide examples of each service model. 1.5 Analyse routine use cases and discuss advantages of each service model. 1.6 Evaluate the implications of future trends and innovations in cloud computing.
2. Compare and explain the significance of cloud deployment models and how they impact business solutions.	2.1 Explain the characteristics and purposes of the different cloud deployment models (public, private, hybrid, and community). 2.2 Identify the benefits and challenges associated with public, private, hybrid, and multi-cloud environments. 2.3 Determine the best cloud deployment model based on specific business needs and use cases.
3. Recognise the basic components of cloud architecture and	3.1 Explain the fundamental concepts and components of cloud architecture and how they are used to support cloud services.

describe how they work together to deliver cloud services.	3.2 Apply architectural good practices to design scalable, reliable, and efficient cloud solutions to well-defined and routine scenarios. 3.3 Analyse various cloud architecture patterns and their use cases.
4. Discuss cloud storage technologies along with their benefits, challenges, and good practices for implementation.	4.1 Outline different storage technologies used in cloud computing. 4.2 Explain the principles of cloud storage. 4.3 Discuss the benefits and challenges associated with cloud storage solutions.
5. Understanding how virtualisation and data centres enable cloud computing.	5.1 Define virtualisation and explain its role in cloud computing. 5.2 Describe the structure and function of data centres. 5.3 Explain how virtual machines (VMs) and containers work. 5.4 Identify the benefits and challenges of virtualisation. 5.5 Describe how data centres are designed for efficiency, scalability, and sustainability.
6. Understand the key principles for successful cloud migration, management and automation.	6.1 Describe major challenges of cloud migration and management. 6.2 Explain the "7 R's" of cloud migration. 6.3 Describe cloud automation and explain the importance and benefits in cloud environments. 6.4 Explain the basic principles of cloud cost management and apply simple strategies to monitor and reduce cloud computing costs in real-world scenarios. 6.5 Describe good and bad practices for cloud migrations and identify the potential risks and consequences of poor migration practices.
7. Discuss the core ethical, legal and security issues inherent in cloud computing.	7.1 Identify and describe major security concerns in cloud computing. 7.2 Discuss privacy issues related to cloud services. 7.3 Apply basic identity and access management (IAM) techniques to control user access and permissions. 7.4 Explain the importance of compliance and how to meet regulatory standards in cloud computing.

Syllabus Content			
Topic No.	**Topic title**	**Proportion**	**Indicative Content**
1	Introduction to Cloud Computing	1/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. What is Cloud Computing?** • Definition and Characteristics • Everyday Examples: Google Drive, Netflix, iCloud. • Why it's called "the cloud" **2. Why the Cloud exists?** • Early Concepts: The origins of cloud computing and early developments. • The problem it solves: storing, accessing and data from everywhere. **3. Benefits of Cloud Computing** • **Scalability**: Ability to scale resources up or down based on demand.

			• **Cost Efficiency**: Reduction in capital expenditure and operational costs. • **Flexibility**: Access to resources and services from anywhere at any time. • **Innovation**: Accelerated innovation through access to advanced technologies and services. **4. Challenges of Cloud Computing** • **Security**: Concerns about data security and privacy. • **Compliance**: Meeting regulatory and compliance requirements. • **Downtime**: Risks associated with service outages and downtime. • **Vendor Lock-In**: Dependence on a single cloud provider and challenges in migrating to another provider. **5. Case Studies and Real-World Applications** • **Industry Examples**: How different industries are leveraging cloud computing (e.g., healthcare, finance, education). • **Success Stories**: Case studies of organisations that have successfully implemented cloud computing solutions. • **Lessons Learned**: Insights and lessons from real-world cloud computing implementations. **6. Myths vs. Facts - Clearing Up Cloud Confusion** • "Is the cloud in the sky?" – fun misconceptions and clarifications. • Distinguish between common misconceptions and the real facts about cloud computing in a fun and interactive way. **7. Practical Activities and Discussions** • **Hands-On Labs**: Setting up a basic cloud service using a popular cloud platform. • **Case Study Analysis**: Analysing a case study of a cloud computing implementation to solve a specific problem (e.g., data storage issues, limited scalability, high IT costs). **8. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 1***
2	Cloud Service Models	2/12 Class Activities: 2 hrs x 2	**1. Introduction to Cloud Service Models** • Overview of cloud service models • Importance of understanding different service models • Real-world examples of IaaS, PaaS, and SaaS providers

		Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**2. Infrastructure as a Service (IaaS)** • **Definition and Characteristics**: Provisioning of virtualised computing resources over the internet. • **Key Features**: Scalability, pay-as-you-go pricing, self-service provisioning. • **Use Cases**: Hosting websites, storage and backup, disaster recovery, development and testing environments. • **Pros and Cons**: Flexibility and control vs. complexity and management overhead. • **Examples**: Amazon Web Services (AWS) EC2, Microsoft Azure Virtual Machines, Google Compute Engine. **3. Platform as a Service (PaaS)** • **Definition and Characteristics**: Providing a platform allowing customers to develop, run, and manage applications without dealing with the underlying infrastructure. • **Key Features**: Development frameworks, middleware, database management, business analytics. • **Use Cases**: Application development and deployment, API development, microservices. • **Pros and Cons**: Simplified development and deployment vs. limited control over the underlying infrastructure. • **Examples**: Google App Engine, Microsoft Azure App Services, Heroku. **4. Software as a Service (SaaS)** • **Definition and Characteristics**: Delivering software applications over the internet on a subscription basis. • **Key Features**: Accessibility from any device, automatic updates, scalability. • **Use Cases**: Email services, customer relationship management (CRM), enterprise resource planning (ERP). • **Pros and Cons**: Ease of use and accessibility vs. potential data security concerns and less customisation. • **Examples**: Microsoft Office 365, Google Workspace, Salesforce. **5. Comparison of IaaS, PaaS, and SaaS** • **Feature Comparison**: Detailed comparison of features offered by IaaS, PaaS, and SaaS. • **Cost Comparison**: Analysis of cost structures and pricing models. • **Suitability for Different Scenarios**: Evaluating which service model is best

			suited for various business needs and use cases. **6. Case Studies and Real-World Applications** • **Industry Examples**: How different industries leverage IaaS, PaaS, and SaaS. • **Success Stories**: Case studies of organizations successfully using each service model. • **Lessons Learned**: Insights and lessons from real-world implementations. **7. Practical Activities and Discussions** • **Group Discussions**: Discussing the benefits and challenges of each service model. • **Hands-On Labs**: Exploring and using IaaS, PaaS, and SaaS services on popular cloud platforms. • **Case Study Analysis**: Analysing case studies of cloud service model implementations. **8. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 1***
3	Cloud Deployment Models	3/12 Class Activities: 2 hrs x 2 Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Cloud Deployment Models** • Definition and significance of cloud deployment models • Overview of the main types of cloud deployment models: public, private, hybrid, and multi-cloud **2. Public Cloud** • **Definition and Characteristics**: Cloud services offered over the public internet and available to anyone who wants to purchase them. • **Key Features**: Scalability, cost-efficiency, and minimal management overhead. • **Use Cases**: Suitable for small to medium-sized businesses, startups, and applications with variable workloads. • **Pros and Cons**: Benefits include lower costs and high scalability; challenges include potential security and compliance issues. • **Examples**: Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform. **3. Private Cloud** • **Definition and Characteristics**: Cloud infrastructure operated solely for a single organization, either on-premises or hosted by a third party.

			• **Key Features**: Enhanced security, control, and customization. • **Use Cases**: Ideal for large enterprises, organizations with strict regulatory requirements, and applications requiring high security. • **Pros and Cons**: Benefits include greater control and security; challenges include higher costs and management complexity. • **Examples**: VMware vSphere, OpenStack, Microsoft Azure Stack. **4. Hybrid Cloud** • **Definition and Characteristics**: Combines public and private clouds, allowing data and applications to be shared between them. • **Key Features**: Flexibility, scalability, and optimised resource utilisation. • **Use Cases**: Suitable for businesses with fluctuating workloads, disaster recovery, and data processing needs. • **Pros and Cons**: Benefits include flexibility and cost-efficiency; challenges include complexity in management and integration. • **Examples**: AWS Outposts, Microsoft Azure Arc, Google Anthos. **5. Multi-Cloud** • **Definition and Characteristics**: Use of multiple cloud computing services in a single heterogeneous architecture. • **Key Features**: Avoids vendor lock-in, enhances redundancy, and optimises performance. • **Use Cases**: Suitable for organisations seeking to leverage the best services from multiple providers. • **Pros and Cons**: Benefits include flexibility and risk mitigation; challenges include complexity in management and interoperability. • **Examples**: Implementations using a combination of AWS, Azure, and Google Cloud services. **6. Community Cloud** • **Definition and Characteristics**: Cloud infrastructure shared by several organisations with common concerns (e.g., security, compliance). • **Key Features**: Shared resources, cost savings, and collaborative benefits. • **Use Cases**: Suitable for organisations within the same industry or with similar regulatory requirements.

			• **Pros and Cons**: Benefits include cost savings and shared expertise; challenges include potential conflicts and shared risks. • **Examples**: Government agencies, healthcare organisations, financial institutions. **7. Comparison of Cloud Deployment Models** • **Feature Comparison**: Detailed comparison of features offered by public, private, hybrid, and multi-cloud models. • **Cost Comparison**: Analysis of cost structures and pricing models. • **Suitability for Different Scenarios**: Evaluating which deployment model is best suited for various business needs and use cases. **8. Case Studies and Real-World Applications** • **Industry Examples**: How different industries leverage various cloud deployment models. • **Success Stories**: Case studies of organizations successfully using each deployment model. • **Lessons Learned**: Insights and lessons from real-world implementations. **9. Activities and Discussions** • **Group Discussions**: Discussing the benefits and challenges of each deployment model. • **Case Study Analysis**: Analysing case studies of cloud deployment model implementations. **10. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 2***
4	Cloud Architecture and Design	4/12 Class Activities: 2 hrs x 2 Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Cloud Architecture** • **Definition and Importance**: Understanding what cloud architecture is and why it is crucial for cloud computing. • **Components of Cloud Architecture**: Front-end platforms, back-end platforms, cloud-based delivery, and network. • **Key Concepts**: Scalability, elasticity, fault tolerance, and high availability. **2. Principles of Cloud Architecture** • **Design for Scalability**: Ensuring the architecture can handle increasing loads. • **Design for Reliability**: Building systems that are resilient to failures. • **Design for Performance**: Optimising the architecture for speed and efficiency.

			• **Design for Security**: Incorporating security best practices into the architecture. **3. Cloud Architecture Patterns** • **Microservices Architecture**: Breaking down applications into smaller, independent services. • **Serverless Architecture**: Building applications without managing server infrastructure. • **Event-Driven Architecture**: Designing systems that respond to events and changes in state. • **Multi-Tier Architecture**: Separating the presentation, application, and data layers. **4. Cloud Design Patterns** • **Anti-Corruption Layer**: Isolating the new system from legacy systems. • **Circuit Breaker**: Preventing cascading failures in distributed systems. • **Retry Pattern**: Handling transient failures by retrying operations. • **Strangler Fig**: Incrementally replacing legacy systems with new functionality. **5. Cloud Architecture Frameworks** • **AWS Well-Architected Framework**: Best practices for designing and operating reliable, secure, efficient, and cost-effective systems in the cloud. • **Google Cloud Architecture Framework**: Guidance on building and managing cloud workloads. • **Microsoft Azure Well-Architected Framework**: Principles for creating high-quality cloud solutions. **6. Case Studies and Real-World Applications** • **Industry Examples**: How different industries implement cloud architecture. • **Success Stories**: Case studies of organizations that have successfully designed and deployed cloud architectures. • **Lessons Learned**: Insights and best practices from real-world implementations. **7. Activities and Discussions** • **Group Discussions**: Discussing the principles and patterns of cloud architecture. • **Case Study Analysis**: Analysing case studies of cloud architecture implementations. **8. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts.

			Learning Outcome: 3
5	Cloud Security	5/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Cloud Security** • **Importance of Cloud Security**: Understanding why security is critical in cloud computing. • **Security Challenges in the Cloud**: Overview of unique security challenges in cloud environments compared to traditional IT infrastructure. **2. Common Security Threats and Vulnerabilities** • **Types of Threats**: Phishing, malware, ransomware, DDoS attacks, insider threats. • **Vulnerabilities**: Misconfigurations, insecure APIs, data breaches, lack of visibility. • **Case Studies**: Real-world examples of cloud security breaches and their impact. **3. Security Good Practices and Tools** • **Encryption**: Data encryption at rest and in transit. • **Identity and Access Management (IAM)**: Implementing IAM policies, multi-factor authentication (MFA). • **Network Security**: Using firewalls, VPNs, and secure network configurations. • **Security Tools**: Overview of tools like AWS Security Hub, Azure Security Centre, Google Cloud Security Command Centre. **4. Compliance and Regulatory Requirements** • **Overview of Compliance Standards**: GDPR, HIPAA, PCI-DSS, SOC 2. • **Meeting Compliance Requirements**: Strategies for ensuring compliance in cloud environments. • **Auditing and Reporting**: Tools and practices for auditing cloud security and generating compliance reports. **5. Identity and Access Management (IAM)** • **IAM Concepts**: Roles, policies, and permissions. • **Implementing IAM**: Best practices for setting up and managing IAM. • **Case Studies**: Examples of effective IAM implementations in the cloud. **6. Monitoring and Incident Response** • **Monitoring Tools**: Using tools like CloudWatch, Azure Monitor, Google Cloud Operations Suite. • **Incident Response Planning**: Developing and implementing an incident response plan.

			• **Responding to Incidents**: Steps to take during and after a security incident.
			• **Case Studies**: Examples of incident response in cloud environments.
			7. Practical Activities and Discussions
			• **Group Discussions**:
			  • Discussing the importance of cloud security and sharing experiences.
			  • Debate the importance of confidential computing and data protection.
			  • Discuss best practices for ensuring security and compliance in cloud environments.
			• **Hands-On Labs**: Exploring security measures on popular cloud platforms.
			• **Case Study Analysis**: Analysing case studies of cloud security incidents and responses.
			8. Assessment and Review
			• **Quizzes:** Regular quizzes to test understanding of key concepts.
			
			Learning Outcome: 5

6	Cloud Storage and Databases	6/12
		
		Class Activities: 2 hrs x 2
		Practical: 2 hrs
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Introduction to Cloud Storage
			• **Definition and Importance**: Understanding what cloud storage is and its significance in modern computing.
			• **Types of Cloud Storage**:
			  • **Object Storage**: Storing data as objects like files, images, videos, ideal for unstructured data.
			  • **Block Storage**: Storing data in fixed-sized blocks, suitable for databases and virtual machines.
			  • **File Storage**: Storing data in a hierarchical file system, useful for shared file systems.
			2. Cloud Storage Solutions
			• **Setting Up Cloud Storage**: Steps to create and configure cloud storage solutions.
			• **Use Cases**: Examples of how different types of cloud storage are used in real-world scenarios.
			• **Best Practices**: Strategies for optimizing cloud storage performance and cost.
			3. Introduction to Cloud Databases
			• **Definition and Importance**: Understanding what cloud databases are and their role in cloud computing.
			• **Types of Cloud Databases**:
			  • **SQL Databases**: Relational databases that use structured

			query language (e.g., Amazon RDS, Google Cloud SQL). • **NoSQL Databases**: Non-relational databases designed for flexible data models (e.g., Amazon DynamoDB, Google Firestore). **4. Managing Cloud Databases** • **Database Setup and Configuration**: Steps to create and configure cloud databases. • **Performance Optimisation**: Techniques for optimising database performance (e.g., indexing, query optimisation). • **Scaling Databases**: Strategies for scaling databases to handle increased load (e.g., read replicas, sharding). **5. Data Security and Compliance** • **Security Measures**: Implementing encryption, access controls, and monitoring to secure data. • **Compliance Standards**: Ensuring compliance with regulations such as GDPR, HIPAA, and PCI-DSS. • **Case Studies**: Examples of organisations implementing security and compliance measures in cloud storage and databases. **6. Backup and Disaster Recovery** • **Backup Strategies**: Techniques for backing up data in the cloud. • **Disaster Recovery Plans**: Developing and implementing disaster recovery plans to ensure data availability and integrity. • **Tools and Services**: Overview of backup and disaster recovery tools provided by cloud providers. **7. Practical Activities and Discussions** • **Group Discussions**: Discussing the benefits and challenges of different cloud storage and database solutions. • **Hands-On Labs**: Setting up and managing cloud storage and databases on popular cloud platforms. • **Case Study Analysis**: Analysing case studies of cloud storage and database implementations. **8. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 4***
7	Virtualisation and Data Centres	7/12	**1. Introduction to Virtualisation** • What is virtualisation? • Physical vs. virtual machines • Hypervisors: Type 1 and Type 2

		Class Activities: 2 hrs x 2 Quizzes: 1 hr Private study: 2 hrs	• Benefits: cost savings, scalability, flexibility **2. Virtual Machines (VMs) and Containers** • What is a virtual machine? • Introduction to containers (e.g., Docker) • Differences between VMs and containers • Use cases in cloud environments **3. How Virtualisation Powers the Cloud** • Resource pooling and abstraction • Multi-tenancy and isolation • Elasticity and on-demand provisioning • Examples from cloud providers (AWS EC2, Google Compute Engine) **4. Introduction to Data Centres** • What is a data centre? • Key components: servers, storage, networking, cooling, power • Tier levels of data centres (Tier I–IV) **5. Data Centre Design and Efficiency** • Layout and architecture • Cooling systems and energy efficiency • Green data centres and sustainability practices • Edge data centres and latency reduction **6. Security and Redundancy in Data Centres** • Physical and digital security measures • Backup power, disaster recovery, and failover systems • Data replication and high availability **7. Case Studies: Real-World Cloud Infrastructure** • Virtual tour of a Google or Microsoft data centre (via video) • How major cloud providers use virtualisation • Cloud regions and availability zones **8. Activities and Discussions** • **Group Discussions**: Debate the environmental impact of large-scale data centres. • **Group Project:** Design a mini data centre layout with cooling and power systems. **9. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 5***
8	Cloud Automation and Orchestration	8/12 Class Activities: 2 hrs x 2 Practical: 2 hrs Quizzes: 1 hr	**1. What is Cloud Automation?** • Simple definition of automation in the cloud • Everyday examples (e.g., automatic backups, scheduled updates) • Why automation is useful (saves time, reduces errors) **2. Introduction to Orchestration** • What is Orchestration?

		Private study: 2 hrs	• Difference between automation and orchestration • Real-world analogy (e.g., automation = one task, orchestration = managing many tasks) • Cloud orchestration: Why It Matters? **3. Automation Tools** • IFTTT (If This Then That): Connects apps and devices with simple rules. • Zapier: Automates workflows between web apps. • Microsoft Power Automate: Automates tasks across Microsoft and third-party services. • Google Workspace Automation: Using Google Sheets, Forms, and Apps Script for simple tasks. **4. Orchestration Tools** • What Are Orchestration Tools? • Why Use Orchestration Tools? • Examples of Orchestration Tools: Kubernetes, Terraform, and AWS CloudFormation (at a high level). • Visual demo, show a short video or diagram of how orchestration tools deploy multiple services together. **5. Case Studies and Real-World Applications** • **Industry Examples**: How different industries leverage automation and orchestration to improve operations. • **Success Stories**: Case studies of organisations successfully implementing cloud automation and orchestration. • **Lessons Learned**: Insights and best practices from real-world implementations. **6. Practical Activities and Discussions** • **Group Discussions**: Discussing the benefits and challenges of cloud automation and orchestration. • **Hands-On Labs**: Simulate a Cloud Automation Task in a beginner-friendly platform. **7. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 6***
9	Cloud Cost Management	9/12 Class Activities: 2 hrs x 2 Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Cloud Cost Management** • **Definition and Importance**: Understanding what cloud cost management is and why it is crucial for organisations using cloud services. • **Key Concepts**: Cost visibility, cost control, cost optimisation, and cost allocation. **2. Cost Management Tools and Techniques**

			• **Monitoring Tools**: Using tools like AWS Cost Explorer, Azure Cost Management, and Google Cloud Cost Management to monitor cloud spending. • **Tagging and Resource Management**: Implementing tagging strategies to track and allocate costs accurately. **3. Cost Optimisation Strategies** • **Resource Optimisation**: Techniques for optimising resource usage, such as right-sizing instances, using reserved instances, and auto-scaling. • **Cost-Aware Architecture**: Designing cloud architectures with cost efficiency in mind. • **Policy Implementation**: Creating and enforcing policies to manage costs, such as shutting down unused resources and optimising storage. **4. Analysing and Forecasting Costs** • **Cost Analysis Tools**: Using tools like AWS Budgets, Azure Cost Management + Billing, and Google Cloud Budgets to analyse spending patterns. • **Forecasting Techniques**: Predicting future costs based on historical data and usage trends. • **Budgeting**: Setting up budgets and alerts to manage cloud spending proactively. • **Hands-On Activity**: Analysing and forecasting costs using cloud cost management tools. **5. Activities and Discussions** • **Group Discussions**: Discussing the benefits and challenges of cloud cost management. • **Hands-On**: Exploring how to manage cloud costs with cloud pricing simulators or calculators. **6. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 6***
10	Cloud Migration	10/12 Class Activities: 2 hrs x 2 Quizzes: 1 hr Private study: 2 hrs	**1. Introduction to Cloud Migration:** • Definition and significance of cloud migration. • Overview of cloud computing models: public, private, and hybrid clouds. **2. Preparation and Planning:** • Assessing current IT landscape and readiness for migration. • Identifying suitable applications and workloads for migration. • Developing a detailed migration plan with timelines and risk management strategies.

			3. Cloud Migration Strategies:
			• Detailed explanation of the "7 R's" of cloud migration:
			  • Rehost (Lift and Shift): Moving applications without significant changes.
			  • Re-platform: Making minor optimisations for the cloud.
			  • Refactor: Redesigning applications to leverage cloud-native features.
			  • Relocate: Moving applications to the cloud without changing the underlaying architecture.
			  • Repurchase: Replacing current applications with a different version or product.
			  • Retain: Keeping certain applications on-premises.
			  • Retire: Decommissioning outdated applications.
			4. Migration Execution:
			• Steps for data migration and application migration.
			• Ensuring data security and integrity during the migration.
			• Testing and validation of migrated applications.
			5. Monitoring and Optimisation:
			• Continuous monitoring of cloud environments for performance and security.
			• Implementing cost optimisation techniques.
			• Automating routine tasks and scaling operations.
			6. Tools and Resources:
			• Overview of popular cloud migration tools and services.
			• Resources for further learning and support.
			7. Case Studies and Good Practices:
			• Real-world examples of successful cloud migrations.
			• Lessons learned and good practices for a smooth transition.
			8. Assessment and Review
			• **Quizzes:** Regular quizzes to test understanding of key concepts.
			
			Learning Outcome: 6

11	Cloud Monitoring and Management	11/12 Class Activities: 2 hrs x 2	**1. Introduction to Cloud Monitoring and Management:** • Definition and significance of cloud monitoring and management.

		Practical: 2 hrs
		Quizzes: 1 hr
		Private study: 2 hrs
			• Overview of cloud monitoring platforms (e.g., AWS CloudWatch, Azure Monitor, Google Cloud Monitoring).
			2. Types of Cloud Monitoring:
			• Infrastructure Monitoring: Tracking the performance and availability of cloud resources like VMs, storage, and networks.
			• Application Performance Monitoring (APM): Monitoring the performance and availability of applications, including response times and error rates.
			• Network Monitoring: Monitoring network components for bandwidth usage, latency, and packet loss.
			• Security Monitoring: Tracking security events and vulnerabilities to protect data and resources.
			• Compliance Monitoring: Ensuring adherence to regulatory and industry standards.
			3. Cloud Monitoring Tools and Services:
			• Overview of popular cloud monitoring tools (e.g., Prometheus, Grafana, Datadog).
			• Features and capabilities of cloud-native monitoring services.
			• Integration of monitoring tools with cloud platforms.
			4. Setting Up Monitoring and Alerts:
			• Configuring monitoring tools to collect and analyse metrics.
			• Setting up alerts and notifications for critical events.
			• Creating custom dashboards for real-time monitoring and visualisation.
			5. Case Studies and Best Practices:
			• Real-world examples of effective cloud monitoring and management.
			• Lessons learned and best practices for maintaining cloud environments.
			6. Practical Activities:
			• **Cloud Monitoring Setup:**
			  • Configure a cloud monitoring tool (e.g., AWS CloudWatch, Azure Monitor) for a sample application.
			  • Set up basic monitoring metrics and create a custom dashboard.
			• **Alert Configuration Exercise:**
			  • Set up alerts for critical metrics such as CPU usage, memory usage, and response times.
			  • Test the alerting system to ensure it triggers correctly.
			7. Discussion Topics:

			• **Benefits and Challenges of Cloud Monitoring:**
			  • Discuss the key benefits of cloud monitoring (e.g., improved performance, cost savings, enhanced security).
			  • Identify common challenges and how to overcome them (e.g., data overload, integration issues).
			• **Choosing the Right Monitoring Tools:**
			  • Debate the pros and cons of different cloud monitoring tools.
			  • Discuss scenarios where specific tools are most appropriate.
			• **Optimising Cloud Performance and Costs:**
			  • Share strategies for optimising cloud performance and managing costs.
			  • Discuss the role of automation in cloud monitoring and management.
			8. Assessment and Review
			  • **Quizzes:** Regular quizzes to test understanding of key concepts.
			
			Learning Outcome: 6

12	Emerging Trends in Cloud Computing	12/12
		
		Class Activities: 2 hrs x 2
		Quizzes: 1 hr
		Private study: 2 hrs
			1. Introduction to Emerging Trends in Cloud Computing:
			  • Overview of the current state of cloud computing.
			  • Introduction to key emerging trends and technologies.
			2. Serverless Computing:
			  • Definition and benefits of serverless computing.
			  • Use cases and examples of serverless architectures.
			3. Quantum Cloud Computing:
			  • Basics of quantum computing and its integration with cloud platforms.
			  • Potential applications and challenges of quantum cloud computing.
			4. AI-Driven Cloud Management:
			  • Role of AI and machine learning in optimising cloud resources.
			  • Examples of AI-driven cloud management tools and techniques.
			5. Confidential Computing:
			  • Explanation of confidential computing and Trusted Execution Environments (TEEs).
			  • Importance of data security and privacy in cloud environments.
			6. Green Cloud Computing:
			  • Strategies for reducing the environmental impact of cloud services.

			• Examples of sustainable practices in cloud computing. **7. Hybrid and Multi-Cloud Strategies:** • Differences between hybrid and multi-cloud approaches. • Benefits and challenges of implementing these strategies. **8. Edge Computing and IoT Integration:** • Overview of edge computing and its relationship with cloud services. • Use cases of IoT devices integrated with cloud platforms. **9. Generative AI in Cloud Computing:** • Introduction to generative AI and its applications in cloud environments. • Examples of industry-specific use cases. **10. Discussion Topics (Select 1 – 2 topics):** • **Impact of Emerging Trends on Cloud Computing:** • Discuss how emerging trends are transforming the cloud computing landscape. • Identify the potential benefits and challenges for businesses. • **Adoption of Serverless Architectures:** • Debate the advantages and disadvantages of serverless computing. • Share experiences and good practices for implementing serverless solutions. • **Sustainability in Cloud Computing:** • Explore strategies for reducing the environmental impact of cloud services. • Share examples of green cloud computing practices and their benefits. • **Hybrid and Multi-Cloud Strategies:** • Discuss the benefits and challenges of hybrid and multi-cloud approaches. • Share experiences and best practices for managing multi-cloud environments. • **Integration of Edge Computing and IoT:** • Explore the benefits of integrating edge computing with cloud services. • Discuss use cases and challenges of IoT and edge computing solutions. **11. Assessment and Review** • **Quizzes:** Regular quizzes to test understanding of key concepts. ***Learning Outcome: 5***

Assessment Type
• 30% Exam • 70% Assignment

References / Reading list
• Manvi, S.S. and Shyam, G.K. (2021). *Cloud Computing: concepts and technologies*. Boca Raton, FL: CRC Press. • Sosinsky, B. (n.d.). *Cloud Computing Bible: The book you need to succeed!* [online] Available at: https://arpitapatel.wordpress.com/wp-content/uploads/2014/10/cloud-computing-bible1.pdf. • Weinman, J. (2012). *Cloudonomics: The Business Value of Cloud Computing.* John Wiley & Sons. – Case Study Resources • Kavis, M.J. (2014). *Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)*. 1st ed. [online] *Perlego*. Wiley. Available at: https://www.perlego.com/book/999658/architecting-the-cloud-design-decisions-for-cloud-computing-service-models-saas-paas-and-iaas-pdf.

Mapping of ILO's

Topic / ILO	1	2	3	4	5	6	7
1. Introduction to Cloud Computing	X						
2. Cloud Service Models	X						
3. Cloud Deployment Models		X					
4. Cloud Architecture and Design			X				
5. Cloud Security							X
6. Cloud Storage and Databases				X			
7. Virtualisation and Data Centres					X		
8. Cloud Automation and Orchestration						X	
9. Cloud Cost Management						X	
10. Cloud Migration						X	
11. Cloud Monitoring and Management						X	
12. Emerging Trends in Cloud Computing	X						

4. Digital Collaboration and Communication Skills

Unit Overview

This unit is designed to equips learners with essential digital skills for modern workplaces, covering a wide range of topics. It begins with an introduction to the importance of digital skills, tools, and platforms, and explores the benefits and challenges of digital collaboration.

This unit includes practical lessons on writing professional emails, using instant messaging and chat tools, and setting up video conferencing. Learners will also gain experience in collaborative document editing, project management tools, and creating engaging digital presentations. Additionally, the unit addresses professional communication on social media, effective team collaboration, and the importance of security and privacy in digital communication. It emphasises digital communication etiquette, understanding cultural differences, and handling conflicts. Finally, this unit looks ahead to future trends in digital collaboration, including emerging tools and the impact of AI and automation.

Title	Digital Collaboration and Communication Skills
Unit reference number	L/651/7210
Credits	12
Level	2
Type	Mandatory

Guided Learning Hours	72 hours	**Total Qualification Time**	120 hours

Learning Outcomes: The Learner will be able to:	**Assessment Criteria:** The Learner can:
1. Utilise digital tools for effective communication	1.1 Explain why digital collaboration and communication are essential in modern workplaces. 1.2 Select and justify the most appropriate digital tools for a specific communication task. 1.3 Demonstrate good practice in the use of digital tools for a specific purpose.
2. Utilise digital presentation tools effectively	2.1 Design and develop visually appealing and effective digital presentations. 2.2 Select and use appropriate presentation software efficiently. 2.3 Incorporate multimedia elements such as images, videos, and audio to enhance presentations. 2.4 Create accessible and inclusive presentations for all audiences.
3. Collaborate effectively in digital environments	3.1 Select and justify the most appropriate digital tools for a specific collaboration task. 3.2 Demonstrate good practice in the use of digital collaboration tools for a specific purpose . 3.3 Identify and resolve common technical problems encountered when using collaboration tools.

4. Undertake simple and routine digital projects and tasks	4.1 Describe the principle activities involved in project management. 4.2 Explain the importance and benefits of using project management tools in various projects. 4.3 Select the most appropriate tools for planning, executing, monitoring, and closing projects. Demonstrate proficiency in using project management tools and software.
5. Apply good practices for digital communication	5.1 Explain principles of good practice for digital collaboration and communication 5.2 Evaluate the use of digital tools against good practice criteria and provide appropriate feedback. 5.3 Track response times, engagement levels, and digital body language indicators.
6. Ensure security and privacy in digital communication	6.1 Explain good practices for security and privacy compliance. 6.2 Select and apply good practices for security and privacy in a specific context. 6.3 Evaluate the effectiveness of security measures and privacy practices and respond appropriately 6.4 Monitor access controls and permissions to ensure only authorised personnel can view or edit information. 6.5 Explain and identify the encrypted communication channels to protect sensitive information.
7. Understand the latest trends and technologies shaping the future of digital collaboration and communication.	7.1 Describe the latest trends and technologies in digital collaboration and communication. 7.2 Analyse how emerging technologies influence digital collaboration and communication practices. 7.3 Develop and present strategies for staying current with evolving digital tools and platforms, demonstrating an understanding of the importance of continuous learning and adaptability. 7.4 Identify potential challenges and opportunities associated with future trends.

Syllabus Content			
Topic No.	**Topic title**	**Proportion**	**Indicative Content**
1	Introduction to Digital Collaboration and Communication	1/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Overview of Digital Collaboration and Communication** • Definition and scope of digital collaboration and communication • Historical evolution and the rise of digital tools in the workplace • The role of digital communication in remote and hybrid work environments • Professional and personal communication – importance of separation **2. Importance of Digital Skills**

			• The necessity of digital literacy in the modern workforce • How digital skills enhance productivity and efficiency • Case studies of successful digital collaboration in various industries **3. Digital Tools and Platforms** • Introduction to popular digital communication tools (e.g., email, instant messaging, video conferencing) • Overview of collaboration platforms (e.g., Slack, Microsoft Teams, Google Workspace) • Features and functionalities of these tools **4. Benefits of Digital Collaboration and Communication** • Increased flexibility and remote work opportunities • Enhanced teamwork and collaboration across geographical boundaries • Improved access to information and resources **5. Challenges of Digital Collaboration and Communication** • Common obstacles (e.g., technical issues, communication barriers) • Strategies to overcome these challenges • The importance of digital etiquette and professionalism • Dangers of permanence of digital communication **6. Principles of Effective Digital Communication** • Selecting the most appropriate tool / channel • Clarity and conciseness in digital messages • Appropriate tone and language for different contexts • The role of feedback and active listening in digital communication **7. Future Trends in Digital Collaboration and Communication** • Emerging technologies and their impact on digital communication (e.g., AI, VR) • Predictions for the future of work and digital collaboration

			• Preparing for continuous changes in digital communication tools **8. Practical Activities and Discussions** • Group discussions on personal experiences with digital collaboration • Hands-on activities using various digital tools • Role-playing scenarios to practice effective digital communication ***9.* Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 1, 3, 7***
2	Email Communication	2/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Email Communication** • Importance of email in professional and personal communication • Overview of email platforms (e.g., Gmail, Outlook) • Basic email components (subject line, body, attachments, signature) **2. Writing Professional Emails** • Structuring an email: subject line, greeting, body, closing, cc, bcc and email signature • Writing clear and concise messages • Tailoring the tone and style to the audience and purpose • Common phrases and templates for different types of emails (e.g., inquiries, follow-ups, complaints) • Reviewing and proofreading email content before sending, with particular attention to tone and emotional state **3. Email Etiquette** • Importance of email etiquette in professional settings • Good practices for email etiquette (e.g., timely responses, appropriate language, avoiding all caps) • Cultural considerations in email communication. • Examples of good and bad email etiquette **4. Managing Email Effectively** • Organising emails using folders, labels, and filters

			• Setting up and managing email rules and filters • Strategies for managing email overload • Using email management tools and features (e.g., snooze, priority inbox) **5. Attachments and Links** • Selecting the most appropriate mechanism for sharing data (e.g. size, security) • Good practices for sending attachments (file size, format) • Using cloud storage links (e.g., Google Drive, OneDrive) • Ensuring attachments are virus-free • Handling large files and sensitive information **6. Email Security and Privacy** • Common email security threats (phishing, malware, spam) • Good practices for securing email accounts (strong passwords, multi-factor authentication, passkeys) • Recognising and avoiding phishing scams • Ensuring privacy and confidentiality in email communication • Data Protection **7. Advanced Email Features** • Using email templates and signatures • Scheduling emails and using delayed send features • Integrating email with other productivity tools (calendars, task managers) • Tracking email opens and responses **8. Practical Activities and Discussions** • Writing and peer-reviewing professional emails • Identifying good and bad practice. • Role-playing scenarios to practice email etiquette • Setting up email organisation systems • Simulating email security breach scenarios and responses **9. Quizzes:**

			• Regular quizzes to test understanding of key concepts. ***Learning Outcome: 1, 5, 6***
3	Instant Messaging and Chat Tools	3/12 Class Activities: 2 hrs x 2 Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Instant Messaging and Chat Tools** • Overview of instant messaging and chat tools (e.g., Slack, Microsoft Teams, WhatsApp) • Differences between synchronous and asynchronous communication • Importance of instant messaging in modern workplaces • Persistence of chat. **2. Features of Instant Messaging and Chat Tools** • Basic features: text/ sms messaging, file sharing, voice and video calls • Advanced features: channels, groups, threads, bots, and integrations • Customisation options: notifications, status, and themes **3. Good Practices for Chat Communication** • Writing clear and concise messages • Using appropriate tone and language • Managing and participating in group chats and channels • Etiquette for professional chat communication (e.g., response time, use of emojis) **4. Organising and Managing Conversations** • Creating and managing channels and groups • Using threads to keep conversations organised • Archiving and searching for past messages • Managing notifications to avoid distractions **5. Collaboration through Chat Tools** • Real-time collaboration on documents and projects • Integrating chat tools with other productivity apps (e.g., Google Workspace, Microsoft Office 365) • Using bots and automation to streamline workflows

			• Case studies of successful and unsuccessful collaboration using chat tools **6. Security and Privacy in Chat Communication** • Common security threats in chat communication (e.g., phishing, data breaches) • Good practices for securing chat accounts (strong passwords, two-factor authentication) • Ensuring privacy and confidentiality in chat conversations • Company policies and compliance requirements for chat communication **7. Troubleshooting Common Issues** • Resolving connectivity and performance issues • Troubleshooting audio and video call problems • Managing storage and file sharing limits • Support resources and help centres for popular chat tools **8. Future Trends in Instant Messaging and Chat Tools** • Emerging features and technologies (e.g., AI-powered chatbots, enhanced security measures) • The impact of remote and hybrid work on chat tool usage • Predictions for the future of instant messaging and chat communication **9. Practical Activities and Discussions** • Hands-on activities using different chat tools • Role-playing scenarios to practice professional chat communication • Group discussions on personal experiences and good practices • Simulating security breach scenarios and responses **10. Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 1, 5, 6, 7***
4	Video Conferencing	4/12	**1. Introduction to Video Conferencing**

		Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	• Definition and importance of video conferencing in modern communication • Overview of popular video conferencing tools (e.g., Zoom, Microsoft Teams, Google Meet) • Historical evolution and the rise of video conferencing, especially during the COVID-19 pandemic • Important differences between F2F meetings and video conferences, **2. Setting Up Video Conferencing Tools** • Installing and configuring video conferencing software • Creating and managing user accounts • Scheduling and joining meetings • Hands-on activity: Setting up a video conference **3. Features of Video Conferencing Tools** • Basic features: video and audio calls, screen sharing, chat • Advanced features: breakout rooms, virtual backgrounds, recording meetings • Customization options: meeting settings, participant controls • Hands-on activity: Exploring and using advanced features **4. Good Practices for Virtual Meetings** • Preparing for a virtual meeting (agenda, materials, setup) • Professional etiquette during video conferences (appearance, behaviour, communication) • Effective participation and engagement strategies • Managing time and keeping meetings on track • Hands-on activity: Role-playing a professional virtual meeting **5. Troubleshooting Common Issues** • Common technical problems (audio, video, connectivity, bandwidth) • Steps to troubleshoot and resolve issues • Using support resources and help centres **6. Security and Privacy in Video Conferencing**

			• Understanding security threats (e.g., Zoombombing, data breaches) • Good practices for securing video conferences (passwords, waiting rooms, encryption) • Ensuring privacy and confidentiality during meetings • Company policies and compliance requirements • Hands-on activity: Implementing security measures in a video conference **7. Enhancing Collaboration through Video Conferencing** • Using collaborative tools within video conferencing platforms (whiteboards, polls) • Integrating video conferencing with other productivity tools (calendars, project management software) • Case studies of successful / unsuccessful collaboration using video conferencing • Hands-on activity: Collaborative project using video conferencing tools **8. Future Trends in Video Conferencing** • Emerging technologies and features (e.g., AI enhancements, immersive and hybrid meeting environments with virtual reality and augmented reality) • The impact of remote and hybrid work on video conferencing usage • Predictions for the future of video conferencing • Discussion: How future trends might affect your work or study **9. Practical Activities and Discussions** • Peer review of virtual meeting practices • Group discussions on personal experiences and good practices • Simulating security breach scenarios and responses **10. Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 1, 3, 5, 6, 7***

5	Collaborative Document Editing	5/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Collaborative Document Editing and Share Drives** • Definition and importance of collaborative document editing and shared drives • Historical evolution and the rise of cloud-based document editing tools • Collaborative document editing vs. shared drives • Benefits and challenges of collaborative editing (e.g., real-time collaboration, version control) **2. Overview of Collaborative Editing Tools** • Introduction to popular tools (e.g., Google Docs, Microsoft Office 365, Dropbox Paper) • Key features and functionalities of each tool • Comparison of tools based on features, ease of use, and integration with other platforms **3. Setting Up Collaborative Documents** • Creating and sharing documents with collaborators • Setting permissions and access levels (view, comment, edit) • Hands-on activity: Setting up a collaborative document and sharing it with peers **4. Real-Time Collaboration Features** • Editing and commenting in real-time • Using chat and discussion features within documents • Tracking changes and version history • Hands-on activity: Collaborating on a document in real-time **5. Organising and Managing Collaborative Documents** • Structuring documents for easy navigation and collaboration • Using folders and labels to organise documents • Implementing version control and document management strategies • Hands-on activity: Organising a set of collaborative documents **6. Good Practices for Collaborative Editing**

			• Establishing clear roles and responsibilities • Setting guidelines for document editing and commenting • Communicating effectively with collaborators • Resolving conflicts and ensuring consensus • Hands-on activity: Developing a set of good practices for a collaborative project **7. Advanced Features and Integrations** • Using templates and add-ons to enhance productivity • Integrating collaborative editing tools with other applications (e.g., project management software, communication tools) • Automating repetitive tasks with scripts and macros • Hands-on activity: Exploring and using advanced features and integrations **8. Security and Privacy in Collaborative Editing** • Understanding security risks and challenges • Scope and duration of sharing • Implementing security measures (e.g., encryption, secure sharing) • Ensuring privacy and confidentiality of collaborative documents • Company policies and compliance requirements • Hands-on activity: Applying security measures to a collaborative document **9. Case Studies and Real-World Applications** • Examples of successful collaborative editing in various industries • Lessons learned from real-world collaborative projects • Discussion: How collaborative editing can improve productivity and teamwork **10. Future Trends in Collaborative Document Editing** • Emerging technologies and features (e.g., AI-powered editing, enhanced collaboration tools)

			• The impact of remote and hybrid work on collaborative editing • Predictions for the future of collaborative document editing • Discussion: How future trends might affect your work or study **11. Practical Activities and Discussions** • Setting up and managing a collaborative document project • Peer review of collaborative editing practices • Group discussions on personal experiences and good practices • Simulating security breach scenarios and responses **12. Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome:3, 5, 6, 7***
6	Project Management	6/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Project Management and Tools** • What is project management? • Key concepts: goals, tasks, timelines, stakeholder • Introduction to project life cycle (initiation, planning, execution • Overview of different types of project management tools (e.g., planning, scheduling, tracking) • Benefits of using project management tools in various industries **2. Planning and Scheduling** • Gantt charts: Creating and interpreting Gantt charts for project planning and scheduling • Task dependencies, milestones and deadlines • Work Breakdown Structure (WBS): Developing a WBS to organise project tasks • Hands-on activity: Creating a Gantt chart and WBS for a simple project **3. Tracking and Monitoring** • Observing the progress of tasks and milestones • Evaluating whether the project is on schedule, within scope and meeting goals. • Identify risks or delays early.

			• Tools and techniques: Gantt charts, progress bars, dashboards • Hands-on activity: Update the Gantt chart created to reflect completed and delayed tasks **4.Case Studies and Real-World Applications** • Examples of successful / unsuccessful project management using various tools • Lessons learned from real-world projects • Discussion: How different tools can improve project outcomes **5. Future Trends in Project Management Tools** • Emerging technologies and features (e.g., AI, machine learning, automation) • The impact of remote and hybrid work on project management tools • Predictions for the future of project management tools • Discussion: How future trends might affect your projects **6. Practical Activities and Discussions** • Setting up and managing a project using various tools • Peer review of project management practices • Group discussions on personal experiences and good practices • Simulating project scenarios and responses using different tools **7. Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 3, 4*, 7**
7	Digital Presentation Skills	7/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Digital Presentation Skills** • Importance of digital presentation skills in modern communication • Overview & comparison of digital presentation tools (e.g., PowerPoint, Prezi, Google Slides) • Benefits of using digital presentations in various contexts (e.g., education, business) **2. Designing Effective Presentations**

			• Principles of good design (e.g., layout, colour schemes, contrast, typography) • Structuring presentations for clarity and impact • Creating a compelling narrative and flow **3. Using Digital Presentation Tools** • Overview of key features and functionalities of popular tools • Creating and editing slides • Adding and formatting text, images, and shapes • Hands-on activity: Creating a basic presentation using a chosen tool **4. Incorporating Multimedia Elements** • Adding videos, audio, and animations to presentations • Good (and bad) practices for using multimedia to enhance engagement. • Ensuring multimedia elements are relevant and support the message • Inappropriate use examples. • Hands-on activity: Integrating multimedia elements into a presentation **5. Delivering Digital Presentations** • Techniques for confident and effective delivery • Managing presentation tools during delivery (e.g., slide transitions, laser pointers) • Engaging the audience and encouraging interaction • Hands-on activity: Practicing delivery of a digital presentation **6. Accessibility and Inclusivity in Presentations** • Understanding the importance of accessibility in digital presentations • Strategies for making presentations accessible (e.g., alt text, captions) • Designing for diverse audiences and inclusive communication • Hands-on activity: Reviewing and improving the accessibility of a presentation **7. Advanced Features and Customisation**

			• Using advanced features such as slide masters, templates, and themes • Customising presentations to fit specific needs and audiences • Exploring add-ons and integrations to enhance functionality • Hands-on activity: Customising a presentation with advanced features **8. Evaluating and Improving Presentations** • Gathering feedback on presentations • Analysing and reflecting on presentation performance • Continuous improvement and iteration • Hands-on activity: Peer review and feedback session **9. Future Trends in Digital Presentations** • Emerging technologies and features (e.g., virtual reality, interactive presentations) • The impact of remote and hybrid work on presentation styles • Predictions for the future of digital presentations • Discussion: How future trends might affect your presentations **10. Practical Activities and Discussions** • Creating and delivering a complete digital presentation • Peer review of presentation design and delivery • Group discussions on personal experiences and good practices • Simulating different presentation scenarios and responses ***Learning Outcome: 2, 7***
8	Social Media for Professional Communication	8/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Social Media for Professional Communication** • Definition and importance of social media in the professional world • Overview of popular social media platforms (e.g., LinkedIn, YouTube, TikTok, X, Facebook) • Benefits of using social media for professional networking and communication • Permanence of content

			2. Creating a Professional Online Presence • Setting up professional profiles on LinkedIn, Twitter, and other platforms • Good practices for profile pictures, headlines, and summaries • Importance of accuracy and level of detail • Highlighting skills, experiences, and accomplishments • Hands-on activity: Creating or updating a LinkedIn profile **3. Networking on Social Media** • Building and expanding a professional network • Engaging with industry groups and communities • Strategies for connecting with professionals and influencers • Hands-on activity: Connecting with peers and professionals on LinkedIn **4. Content Creation and Sharing** • Types of content suitable for professional sharing (e.g., articles, posts, videos) • Good practices for creating engaging and relevant content • Using hashtags and mentions to increase visibility • Hands-on activity: Writing and sharing a professional post **5. Effective Communication on Social Media** • Crafting professional messages and posts • Engaging in meaningful conversations and discussions • Responding to comments and messages appropriately • Hands-on activity: Participating in a professional discussion on Twitter or LinkedIn **6. Branding and Personal Marketing** • Developing a personal brand and online identity • Consistency in messaging and visual elements • Promoting personal achievements and projects • Hands-on activity: Creating a personal branding strategy

			7. Social Media Etiquette and Good Practices • Understanding the do's and don'ts of professional social media use • Maintaining professionalism in all interactions • Handling negative feedback and conflicts gracefully • Hands-on activity: Role-playing scenarios to practice social media etiquette **8. Security and Privacy on Social Media** • Recognising common security threats (e.g., phishing, data breaches) • Implementing privacy settings and controls • Protecting personal and professional information, intellectual property rights, and copyright • Hands-on activity: Reviewing and updating privacy settings on social media accounts **9. Measuring and Analysing Social Media Impact** • Tools for tracking social media engagement and performance (e.g., analytics) • Interpreting metrics and data to improve social media strategy • Adjusting content and engagement strategies based on insights • Hands-on activity: Analysing the performance of a social media post **10. Case Studies and Real-World Applications** • Examples of successful professional social media use • Lessons learned from real-world social media strategies • Discussion: How social media can enhance career opportunities **11. Future Trends in Social Media for Professional Communication** • Emerging platforms and technologies (e.g., Clubhouse, TikTok for professionals) • The impact of AI and automation on social media

			• Predictions for the future of professional social media use • Discussion: How future trends might affect your professional communication **12. Practical Activities and Discussions** • Creating and sharing professional content on social media • Peer review of social media profiles and posts • Group discussions on personal experiences and good practices • Simulating different social media scenarios and responses **13. Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 1, 6, 7***
9	Digital Collaboration in Teams	9/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Digital Collaboration in Teams** • Definition and importance of digital collaboration • Comparison Digital vs F2F teams • Overview of digital collaboration tools (e.g., Slack, Microsoft Teams, Trello) • Benefits of digital collaboration for productivity and innovation **2. Digital Collaboration Tools and Platforms** • Key features and functionalities of popular collaboration tools • Comparison of tools based on team needs and project requirements • Hands-on activity: Setting up and using a digital collaboration tool **3. Effective Team Communication** • Principles of effective communication in digital teams • Establishing team roles and ground rules • Synchronous vs. asynchronous communication • Good practices for clear and concise communication • Hands-on activity: Practicing effective communication in a digital team setting **4. Collaborative Project Management** • Using project management tools to organise and track team tasks (e.g., Asana, Monday.com)

			• Setting goals, milestones, and deadlines • Assigning tasks and responsibilities **5. Building and Maintaining Team Cohesion** • Strategies for building trust and rapport in virtual teams • Encouraging participation and engagement • Techniques for virtual team-building activities • Hands-on activity: Conducting a virtual team-building exercise **6. Conflict Resolution in Digital Teams** • Common sources of conflict in virtual teams • Strategies for managing and resolving conflicts • Role-playing scenarios to practice conflict resolution • Hands-on activity: Simulating conflict resolution in a digital team **7. Collaborative Decision-Making** • Techniques for collaborative decision-making (e.g., brainstorming, consensus-building) • Tools for facilitating group decisions (e.g., polls, surveys) • Hands-on activity: Facilitating a group decision-making process **8. Security and Privacy in Digital Collaboration** • Understanding security risks in digital collaboration • Implementing security measures (e.g., encryption, secure access) • Ensuring privacy and confidentiality of team communications • Hands-on activity: Applying security measures to a digital collaboration tool **9. Evaluating Team Performance** • Metrics and tools for evaluating team performance • Providing and receiving constructive feedback • Continuous improvement and iteration • Hands-on activity: Conducting a team performance review

			10. Case Studies and Real-World Applications • Examples of successful digital collaboration in various industries • Lessons learned from real-world digital team projects • Discussion: How digital collaboration can enhance team performance **11. Future Trends in Digital Collaboration** • Emerging technologies and features (e.g., AI, virtual reality) • The impact of remote and hybrid work on digital collaboration • Predictions for the future of digital teamwork • Discussion: How future trends might affect your team collaboration **12. Practical Activities and Discussions** • Setting up and managing a digital team project • Peer review of collaboration practices • Group discussions on personal experiences and good practices • Simulating different collaboration scenarios and responses **13. Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 1, 3, 6, 7***
10	Security and Privacy in Digital Communication	10/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Security and Privacy in Digital Communication** • Definition and significance of security and privacy in digital communication • Overview of common security threats (e.g., phishing, malware, data breaches) • Legal compliance • Importance of maintaining privacy in personal and professional communication **2. Common Security Threats and Vulnerabilities** • Types of security threats: phishing, malware, ransomware, social engineering • Vulnerabilities in digital communication tools and platforms

			• Case studies of security breaches and their impact • Hands-on activity: Identifying security threats in a simulated environment **3. Good Practices for Securing Digital Communication** • Using strong passwords and multi-factor authentication • Encrypting communications (e.g., email encryption, secure messaging apps) • Regular software updates and patch management • Hands-on activity: Setting up and using encryption tools **4. Privacy Protection Strategies** • Understanding data privacy principles (e.g., data minimisation, purpose limitation) • Managing privacy settings on digital communication platforms • Protecting personal information online (e.g., avoiding oversharing, using pseudonyms) • Hands-on activity: Configuring privacy settings on social media and communication tools **5. Legal and Ethical Standards** • Overview of relevant laws and regulations (e.g., GDPR, CCPA, HIPAA) • Ethical considerations in digital communication • Compliance requirements for businesses and individuals • Hands-on activity: Reviewing and discussing case studies on legal and ethical issues **6. Tools and Technologies for Secure Communication** • Secure email services (e.g., ProtonMail, Tutanota) • Encrypted messaging apps (e.g., Signal, WhatsApp) • Virtual Private Networks (VPNs) and their use cases • Hands-on activity: Setting up and using a VPN **7. Managing Security in Collaborative Environments** • Securing collaborative tools (e.g., Google Workspace, Microsoft 365)

			• Implementing access controls and permissions • Monitoring and auditing collaborative activities • Hands-on activity: Configuring security settings in a collaborative tool **8. Responding to Security Incidents** • Steps to take in the event of a security breach • Incident response planning and execution • Communicating with stakeholders during a security incident • Hands-on activity: Simulating a security incident response **9. Future Trends in Security and Privacy** • Emerging threats and vulnerabilities (e.g., AI-driven attacks, IoT security) • Advances in security technologies (e.g., blockchain, quantum encryption) • Predictions for the future of digital communication security and privacy • Discussion: How future trends might affect your digital communication practices **10. Case Studies and Real-World Applications** • Examples of successful security and privacy practices in various industries • Lessons learned from real-world security incidents • Discussion: How to apply these lessons to your own digital communication **11. Practical Activities and Discussions** • Conducting a security audit of your digital communication tools • Peer review of security and privacy practices • Group discussions on personal experiences and good practices • Simulating different security scenarios and responses **12. Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 6***

11	Digital Communication Etiquette	11/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Digital Communication Etiquette** • Definition and significance of digital communication etiquette (netiquette) • Historical context and evolution of netiquette • The impact of digital communication on personal and professional relationships **2. Principles of Digital Communication Etiquette** • Respect and consideration for others • Clarity and conciseness in communication • Appropriate tone and language • Understanding the context and audience **3. Appropriate and Inappropriate Behaviours** • Examples of respectful and disrespectful behaviours in digital communication • The consequences of inappropriate behaviour (e.g., cyberbullying, harassment) • Case studies of digital communication mishaps and their resolutions • Hands-on activity: Identifying appropriate and inappropriate behaviours in various scenarios **4. Good Practices for Digital Communication** • Crafting clear and concise messages • Using proper grammar and punctuation • Avoiding misunderstandings and misinterpretations • Hands-on activity: Writing and peer-reviewing digital messages **5. Managing and Resolving Conflicts Online** • Common sources of conflict in digital communication • Techniques for de-escalating conflicts (e.g., active listening, empathy) • Strategies for resolving misunderstandings and disputes • Hands-on activity: Role-playing conflict resolution scenarios

			6. Promoting a Positive Digital Environment • Encouraging positive interactions and feedback • Recognising and addressing negative behaviour • Building a supportive and inclusive online community • Hands-on activity: Developing guidelines for a positive digital environment **7. Privacy and Security Considerations** • Protecting personal information and respecting others' privacy • Understanding the importance of confidentiality in digital communication • Implementing security measures to safeguard communication • Hands-on activity: Reviewing and updating privacy settings on digital platforms **8. Cultural Sensitivity in Digital Communication** • Understanding cultural differences and their impact on communication • Adapting communication styles to diverse audiences • Avoiding cultural misunderstandings and biases • Hands-on activity: Practicing culturally sensitive communication **9. Legal and Ethical Aspects of Digital Communication** • Overview of relevant laws and regulations (e.g., data protection, copyright) • Ethical considerations in digital communication • Compliance with legal and ethical standards • Hands-on activity: Analysing case studies on legal and ethical issues **10. Future Trends in Digital Communication Etiquette** • Emerging technologies and their impact on communication etiquette • Predictions for the future of digital communication

			• Discussion: How future trends might affect digital communication practices **11. Case Studies and Real-World Applications** • Examples of effective digital communication in various contexts • Lessons learned from real-world digital communication experiences • Discussion: How to apply these lessons to your own digital communication **12. Practical Activities and Discussions** • Creating and sharing digital communication guidelines • Peer review of communication practices • Group discussions on personal experiences and good practices • Simulating different communication scenarios and responses **13. Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 5***
12	Future Trends in Digital Collaboration and Communication	12/12 Class Activities: 2 hrs x 2 Practical: 1 hr Quizzes: 1 hr Private study: 3 hrs	**1. Introduction to Future Trends in Digital Collaboration and Communication** • Overview of the rapid evolution of digital technologies • Importance of staying updated with emerging trends • The role of innovation in digital collaboration and communication **2. Artificial Intelligence (AI) and Machine Learning** • Applications of AI in digital communication (e.g., chatbots, virtual assistants) • AI-driven collaboration tools (e.g., automated scheduling, smart email responses) • Ethical considerations and challenges of AI in communication • Hands-on activity: Exploring AI-powered tools for communication **3. Augmented Reality (AR) and Virtual Reality (VR)**

			• Introduction to AR and VR technologies • Use cases for AR and VR in collaboration (e.g., virtual meetings, remote assistance) • Benefits and limitations of AR and VR in digital communication • Hands-on activity: Experimenting with AR/VR tools for collaboration **4. 5G and Advanced Connectivity** • Overview of 5G technology and its impact on digital communication • Enhanced connectivity and its benefits for remote collaboration • Future applications enabled by 5G (e.g., real-time data sharing, IoT integration) • Hands-on activity: Analysing the potential of 5G in digital collaboration **5. Blockchain Technology** • Basics of blockchain and its relevance to digital communication • Applications of blockchain in secure communication and collaboration • Case studies of blockchain implementation in digital environments **6. Remote and Hybrid Work Models** • Trends in remote and hybrid work environments • Tools and strategies for effective remote collaboration • Balancing productivity and well-being in remote work settings • Hands-on activity: Developing a remote work strategy for a team **7. Collaborative Platforms and Ecosystems** • Evolution of collaborative platforms (e.g., Microsoft Teams, Slack) • Integration of multiple tools and services into unified ecosystems • Future trends in platform interoperability and user experience • Hands-on activity: Integrating various tools into a collaborative ecosystem **8. Data Analytics and Insights**

			• Role of data analytics in enhancing digital communication • Tools for analysing communication patterns and team performance • Using data-driven insights to improve collaboration • Hands-on activity: Analysing communication data to identify improvement areas **9. Security and Privacy in Future Digital Environments** • Emerging security threats and challenges such as AI- enhanced cyber-attacks, advanced disinformation campaigns, quantum computing threat, IoT vulnerabilities. • Advanced security measures for future digital communication advanced encryption technique, biometric authentication, Privacy-Enhancing Technologies (PETs), artificial intelligence for threat detection. • Ensuring privacy in increasingly connected environments • Hands-on activity: Implementing advanced security measures in digital tools **10. Ethical and Social Implications** • Ethical considerations in the use of emerging technologies • Social impact of future digital communication trends • Balancing innovation with ethical responsibility • Discussion: Debating the ethical implications of future trends **11. Case Studies and Real-World Applications** • Examples of organisations successfully adopting future trends • Lessons learned from early adopters of emerging technologies ○ Discussion: How to apply these lessons to your own digital collaboration practices **12. Practical Activities and Discussions** • Exploring and experimenting with emerging tools and technologies

			• Peer review of innovative solutions and strategies • Group discussions on personal experiences and good practices • Simulating future scenarios and developing adaptive strategies **13. Quizzes:** • Regular quizzes to test understanding of key concepts. ***Learning Outcome: 7***

Assessment Type
• 30% Exam • 70% Assignment

References / Reading list
• Dhawan, E. (2023) *DIGITAL BODY LANGUAGE: how to build trust and connection, no matter the distance.* S.L.: Griffin. • Neeley, T. (2021) *Remote Work Revolution*. HarperCollins. • Arun Arora *et al.* (2020) *Fast times: how digital winners set direction, learn, and adapt*. Seattle: Amazon Publishing. • João Ferreira (2020) *Hands-on Microsoft Teams: a practical guide to enhancing enterprise collaboration with Microsoft Teams and Office 365*. Birmingham, Uk: Packt Publishing, Limited.

Mapping of ILO's

Topic / ILO	1	2	3	4	5	6	7
1. Introduction to Digital Collaboration and Communication	X		X				X
2. Email Communication	X				X	X	
3. Instant Messaging and Chat Tools	X				X	X	X
4. Video Conferencing	X		X		X	X	X
5. Collaborative Document Editing			X		X	X	X
6. Project Management			X	X			X
7. Digital Presentation Skills		X					X
8. Social Media for Professional Communication	X					X	X
9. Digital Collaboration in Teams	X		X			X	X
10. Security and Privacy in Digital Communication						X	
11. Digital Communication Etiquette					X		
12. Future Trends in Digital Collaboration and Communication							X