Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/95

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*This component will introduce learners to the internal workings of the Central Processing Unit (CPU)*

Units 1: Components of a computer			
1.1 The characteristics of contemporary processors, input, output and storage devices	✓		✓
Specification Points	**1.1.1 Structure and function of the processor**		**1.1.2 Types of processor**
	(a) The Arithmetic and Logic Unit; ALU, Control Unit and Registers:		(a) The differences between and uses of CISC and RISC processors.
	Program Counter | Accumulator | Memory Address Register | Memory Data Register | Current Instruction Register| buses: data, address and control:		(b) GPUs and their uses (including those not related to graphics).
	how this relates to assembly language programs.		(c) Multicore and Parallel systems.
	(b) The Fetch-Decode-Execute Cycle; including its effects on registers.		**1.1.3 Input, Output & Storage**
	(c) The factors affecting the performance of the CPU: clock speed, number of cores, cache.		(a) How different input, output and storage devices can be applied to the solution of different problems.
	(d) The use of pipelining in a processor to improve efficiency.		(b) The uses of magnetic, flash and optical storage devices.
	(e) Von Neumann, Harvard and contemporary processor architecture.		(c) RAM and ROM.
			(d) Virtual storage.

Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/75

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*This unit looks at* Types of software and the development of different methodologies used to develop software

Unit 2: Systems Software

	1.2.1 Systems Software	✓	1.2.2 Applications Generation	✓
Specification Points	(a) The need for, function and purpose of operating systems.		(a) The nature of applications, justifying suitable applications for a specific purpose.	
	(b) Memory Management (paging, segmentation and virtual memory).		(b) Utilities.	
	(c) Interrupts, the role of interrupts and Interrupt Service Routines (ISR), role within the Fetch-Decode-Execute Cycle.		(c) Open source vs closed source.	
	(d) Scheduling: round robin, first come first served, multi-level feedback queues, shortest job first and shortest remaining time.		(d) Translators: Interpreters, compilers and assemblers.	
	(e) Distributed, embedded, multi-tasking, multi-user and Real Time operating systems.		(e) Stages of compilation (lexical analysis, syntax analysis, code generation and optimisation).	
	(f) BIOS.		(f) Linkers and loaders and use of libraries.	
	(g) Device drivers.			
	(h) Virtual machines, any instance where software is used to take on the function of a machine, including executing intermediate code or running an operating system within another.			

Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/78

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*This component will look at the types of software and the different methodologies used to develop software.*

Unit 3: Software Development

1.2 Software and software development	✓		✓

Specification Points	1.2.3 Software development		1.2.4 Types of Programming Language	
	(a) Understand the waterfall lifecycle, agile methodologies, extreme programming, the spiral model and rapid application development.		(a) Need for and characteristics of a variety of programming paradigms.	
	(b) The relative merits and drawbacks of different methodologies and when they might be used.		(b) Procedural languages.	
	(c) Writing and following algorithms.		(c) Assembly language (including following and writing simple programs with the Little Man Computer instruction set).	
			(d) Modes of addressing memory (immediate, direct, indirect and indexed).	
			(e) Object-oriented languages with an understanding of classes, objects, methods, attributes, inheritance, encapsulation and polymorphism.	

Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/128

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*This unit looks at* how data is exchanged between different systems. This includes how compression, encryption & hashing work.

Unit 4: Exchanging Data		✓
Specification Points	**1.3.1 Compression. Encryption & Hashing**	
	(a) Lossy vs Lossless compression.	
	(b) Run length encoding and dictionary coding for lossless compression.	
	(c) Symmetric and asymmetric encryption.	
	(d) Different uses of hashing.	

Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/106

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*This component will look at how data is exchanged between different systems including Networks and on the web.*

Unit 5: Networks & Web Technologies

1.3 Exchanging data	✓		✓

Specification Points

1.3.3 Networks		1.3.4 Web Technologies	
(a) Characteristics of networks and the importance of protocols and standards.		(a) HTML, CSS and JavaScript. See appendix 5d.	
(b) The internet structure:		(b) Search engine indexing.	
The TCP/IP Stack | DNS | Protocol layering | LANs and WANs | Packet and circuit switching.		(c) PageRank algorithm.	
(c) Network security and threats, use of firewalls, proxies and encryption.		(d) Server and client side processing.	
(d) Network hardware.			
(e) Client-server and peer to peer.			

Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/77

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*In this component you will look at how data is represented and stored within different structures and how different algorithms that can be applied to these structures*

Unit 6: Data Types

1.4 Data types, structures & algorithms	✓		✓

Specification Points

(a) Primitive data types, integer, real/floating point, character, string and Boolean.		(f) Convert positive integers between binary hexadecimal and denary.	
(b) Represent positive integers in binary.		(g) Representation and normalisation of floating point numbers in binary.	
(c) Use of sign and magnitude and two's complement to represent negative numbers in binary.		(h) Floating point arithmetic, positive and negative numbers, addition and subtraction.	
(d) Addition and subtraction of binary integers.		(i) Bitwise manipulation and masks: shifts, combining with AND, OR, and XOR.	
e) Represent positive integers in hexadecimal.		(j) How character sets (ASCII and UNICODE) are used to represent text.	

Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/135

Assessment		
Assessment of this unit will involve taking an end of unit test.		*This unit will look at how data is exchanged between different systems, how algorithms can be used to describe problems and also how data is represented and stored within differnet structures.*

Unit 7: Data Structures

1.3 Exchanging data	✓	1.4 Data types, data structures & Algorithms	✓
Specification Points			
1.3.2 Database		**1.4.2 Data Structures**	
(a) Relational database, flat file, primary key, foreign key, secondary key, entity relationship modelling, normalisation and indexing.		(a) Arrays (of up to 3 dimensions), records, lists, tuples.	
(b) Methods of capturing, selecting, managing and exchanging data.		(b) The following structures to store data: linked-list, graph (directed and undirected), stack, queue, tree, binary search tree, hash table.	
(c) Normalisation to 3NF.		(c) How to create, traverse, add data to and remove data from the data structures mentioned above	
(d) SQL – Interpret and modify.		*(NB this can be **either** using arrays and procedural programming **or** an object-oriented approach).*	
(e) Referential integrity.		**2.3.1 Algorithms**	
(f) Transaction processing, ACID (Atomicity, Consistency, Isolation, Durability), record locking and redundancy.		(d) Comparison of the complexity of algorithms.	
		(e) Algorithms for the main data structures, (stacks, queues, trees, linked lists, depth-first (post-order) and breadth-first traversal of trees).	
		(f) Standard algorithms (bubble sort, insertion sort, merge sort, quick sort, Dijkstra's shortest path algorithm, A* algorithm, binary search and linear search).	

Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/66

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*In this component you will look at how data is represented and stored within different structures and how different algorithms that can be applied to these structures*

Unit 8: Boolean Algebra			
1.4 Data types, data structures and algorithms	✓		✓

Specification Points	1.4.3 Boolean Algebra	
	(a) Define problems using Boolean logic	
	(b) Manipulate Boolean expressions, including the use of Karnaugh maps to simplify Boolean expressions	
	(c) Use the following rules to derive or simplify statements in Boolean algebra: De Morgan's Laws, distribution, association, commutation, double negation.	
	(d) Using logic gate diagrams and truth tables	
	(e) The logic associated with D type flip flops, half and full adders.	

Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/60

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*In this component you will look at the individual moral, social, ethical and cultural opportunities and risks of digital technology. Legislation surrounding the use of computers and ethical issues that can or may in the future arise from the use of computers*

Unit 9: Legal, Moral, Ethical & Cultural Issues

1.5 Legal, Moral, Cultural & Ethical Issues	✓		✓

Specification Points

1.5.1 Computing related legislation		1.5.2 Moral & Ethical Issues	
(a) The Data Protection Act 1998.		The individual moral, social, ethical and cultural opportunities and risks of digital technology:	
(b) The Computer Misuse Act 1990.		Computers in the workforce | Automated decision making |Artificial intelligence | Environmental effects | Censorship and the Internet | Monitor behaviour |Analyse personal information | Piracy and offensive communications | Layout, colour paradigms and character sets. |	
(c) The Copyright Design and Patents Act 1988.			
(d) The Regulation of Investigatory Powers Act 2000.			

Name:						Target Grade	
End of unit grade:	SBE	BE	E	AE	SAE	Homework Marks	/95

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*In this unit you look at Elements of computational thinking and demonstrate that you understand what is meant by computational thinking.*

Unit 10: Computational Thinking

2.1 Elements of computational thinking	✓		✓

Specification Points

2.1.1 Thinking Abstractly		**2.1.4 Thinking Logically**	
(a) The nature of abstraction.		(a) Identify the points in a solution where a decision has to be taken.	
(b) The need for abstraction.		(b) Determine the logical conditions that affect the outcome of a decision.	
(c) The differences between an abstraction and reality.		(c) Determine how decisions affect flow through a program.	
(d) Devise an abstract model for a variety of situations.		**2.1.5 Thinking Concurrently**	
2.1.2 Thinking Ahead		(a) Determine the parts of a problem that can be tackled at the same time.	
(a) Identify the inputs and outputs for a given situation.		(b) Outline the benefits and trade offs that might result from concurrent processing in a particular situation.	
(b) Determine the preconditions for devising a solution to a problem.		**2.2.2 Computational Methods**	
(c) The nature, benefits and drawbacks of caching.		(a) Features that make a problem solvable by computational methods.	
(d) The need for reusable program components.		(b) Problem recognition.	
2.1.3 Thinking Procedurally		(c) Problem decomposition.	
(a) Identify the components of a problem.		(d) Use of divide and conquer.	
(b) Identify the components of a solution to a problem.		(e) Use of abstraction.	
(c) Determine the order of the steps needed to solve a problem.		(f) Learners should apply their knowledge of:	
(d) Identify sub-procedures necessary to solve a problem.		*Backtracking | Datamining | Heuristics | Performance Modelling | Pipelining | Visulisation to solve problems*	

Name:						Target Grade	
End of topic grade:	SBE	BE	E	AE	SAE	Homework Marks	/120

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*In this component you will look at how computers can be used to solve problems and programs can be written to solve them (Learners will benefit from being able to program in a procedure/imperative language and object oriented language.)*

Unit 11: Programming Techniques

2.2 Problem solving & Programming	✓		✓

Specification Points	2.2.1 Programming techniques	
	(a) Programming constructs: sequence, iteration, branching.	
	(b) Recursion, how it can be used and compares to an iterative approach.	
	(c) Global and local variables.	
	(d) Modularity, functions and procedures, parameter passing by value and by reference.	
	(e) Use of an IDE to develop/debug a program.	
	(f) Use of object oriented techniques.	

Name:						Target Grade	
End of topic grade:	SBE	BE	E	AE	SAE	Homework Marks	/110

Assessment		Unit Description
Assessment of this unit will involve taking an end of unit test.		*In this component you will look at the use of algorithms to describe problems and standard algorithms*

Unit 12: Algorithms

2.3 Algorithms	✓		✓

Specification Points	2.3.1 Algorithms	
	(a) Analysis and design of algorithms for a given situation	
	(b) The suitability of different algorithms for a given task and data set, in terms of execution time and space.	
	(c) Measures and methods to determine the efficiency of different algorithms, Big O notation (constant, linear, polynomial, exponential and logarithmic complexity).	
	(d) Comparison of the complexity of algorithms.	
	(e) Algorithms for the main data structures, (stacks, queues, trees, linked lists, depth-first (post-order) and breadth-first traversal of trees).	
	(f) Standard algorithms (bubble sort, insertion sort, merge sort, quick sort, Dijkstra's shortest path algorithm, A* algorithm, binary search and linear search).	