TAC – Computer Science						
GCSE Specification Statement	Year 9		Year 10		Year 11	
	Knowledge	Skills	Knowledge	Skills	Knowledge	Skills
Understand and apply the fundamental principles and concepts of Computer Science, including abstraction, decomposition, logic, algorithms, and data representation. The following GCSE Specification Statement will be assessed in: Unit – Algorithms Unit – Programming Fundamentals Unit - Iteration Unit - Boolean Logic	Students will develop knowledge on what an algorithm is and how it can be used to solve specific problems. Students will develop knowledge on the basic constructs of all algorithms: • Sequence • Selection • Iteration Students will develop knowledge on the use of: • Input • Processing • Output In algorithms. Students will develop knowledge on how to express algorithms using flowcharts and pseudocode.	Students will develop algorithmic thinking in the form of a Flow Chart and Pseudocode. Students solutions will include the use of the following basic constructs: • Sequence • Selection • Iteration Students will develop the use of variables, constants, operators, inputs, outputs and assignments within pseudocode solutions. Students will develop the skill on how to produce algorithms in flowchart and pseudocode. Students will apply this skill by using the common arithmetic operators and Boolean operators within pseudocode. Students will develop the use of data types such as: • Integer • Real • Boolean • String				

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Unit – Data Types and Structures Unit – Using Lists Unit – Regular Expressions	Students will develop knowledge of arithmetic, relational and Boolean operators. Students will explain what is meant by 'data type' and list some common types. Students will describe other data structures such as solving problems including both one- and two-dimensional arrays.	Students will create and work with simple array data structures. Students will create and work with two dimensional arrays.				

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Analyse problems in computational terms through practical experience of solving such problems, including designing, writing and debugging programs. The following GCSE Specification Statement will be assessed in: Unit - Selection & Iteration Unit - Problem Solving Unit – Searching & Sorting Algorithms Unit – Using Lists	Students will explain what is meant by iteration. Students will explain the difference between definite and indefinite iteration. Students develop knowledge on methods for analysing algorithms such as trace tables. Students will explain why user input is needed. Students will describe ways in which data input can be validated. Students will investigate the purpose of testing	Students will make use of the three basic programming constructs to control the flow of a program: • Count • Condition Controlled Students will develop the skill of interpreting, correct of complete algorithms. Students will develop defensive designs including: • Input • Sanitisation/Validation • Planning for contingencies, anticipating misuse authentication Students will work with text files with a particular focus of basic file handling operations: • Open • Read • Write • Close	Students will explain what is meant by computational thinking. Students will explain what is meant by decomposition and abstraction and use them to solve problems. Students will explain what is meant by top-down and bottom-up problem solving. Students will describe the systems development cycle to analyse problems, design implement solutions and test the outcomes.	Students will apply computational thinking through problem solving by applying abstraction and decomposition. Students will create algorithms to solve problems that they have analysed. Students will create structured programs using functions and procedures. Students will apply their understanding of the systems development cycle by investigating the maintainability through: • Comments and indentations • Types of testing –		

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Unit – Reading & Writing Files Unit – Python Sorting Lists Unit – Regular Expressions	and the type of testing.		Students will describe the difference between low- and high-level languages.	iteration and final • How to identify syntax and logic errors • Selecting and using suitable test data. Students will also develop skills with the use of common tools available in an integrated development environment (IDE): • Editors • Error diagnostics • Run-time environment • Translators		

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			Students will explain the advantages of using high level languages. Students will explain how program instructions are encoded in low languages. Students will explain why high-level languages need to be translated. Students will explain the characteristics and use of: • Assembler • Compiler • Interpreter			

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Think creatively, innovatively, analytically, logically and critically. The following GCSE Specification Statement will be assessed in: Unit – Boolean Logic	Students will develop knowledge on simple logic diagrams using the operations, AND, OR and NOT truth tables. Students investigate the combination of Boolean operators using AND, OR and NOT to two levels. Students will explain why sorted lists are of more value than unsorted lists. Students will describe the bubble sort, selection sort and merge sort algorithms. Students will describe the linear and binary search algorithms.	Students will create truth tables for Boolean operators. Students will draw AND, OR and NOT logic gates. Students will create truth tables for logic circuits to solve problems. Students will create standard algorithms for: • Bubble Sort • Merge Sort • Insertion Sort Students will create standard algorithms for: • Binary Search • Linear Search Students will write code for the implementation of these algorithms.				

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Understand the components that make up digital systems, and how they communicate with one another and with other systems. The following GCSE Specification Statement will be assessed in: Unit – Networks Unit – System Security Unit – Computer Systems HW Unit - Computer Systems SW					Students will explain why is meant by a computer system. Students will explain the difference between RAM and ROM. Students will describe the purpose of ROM in a computer system. Students describe the purpose of RAM in a computer system. Students will identify the need for virtual memory. Students will explain what is meant by embedded systems. Students will identify the purpose of embedded systems. Students will describe the structure of the central processing unit and the functions of its components.	Students will interpret client requirements and interpret the cause and effect for different types of memory within a computer system. Students will demonstrate examples of embedded systems.

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					Students will identify the purpose of the CPU. Students will explain the Von Neumann architecture: • Memory Address Register • Program Counter • Accumulator • Arithmetic Logic Unit • Control Uni • Cache Students will describe the fetch-decode-execute cycle. Students will explain the need for and role of multiple cores and cache and virtual memory.	Students will develop their understanding of the Von Neumann architecture through the little man computer. Students will demonstrate the function of the CPU as a set of fetch and execute instructions stored in memory. Students will demonstrate the ability to interpret common characteristics of CPUs and what affect their performance in: • Clock Speed • Cache Size • Number of Cores

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					Students will describe secondary storage media and the advantages/disadvantages of each. Students will be able to identify the following types of secondary storage: • Optical • Magnetic • Solid State	Students will demonstrate the need for secondary storage including: • Data capacity and the calculation of data capacity. • Common types of storage. • The characteristics such as capacity, speed, portability, durability, reliability and cost. Throughout, students will be able to justify the application for these types of secondary storage. Throughout, students will be able to demonstrate the purpose and functionality of: • System Software

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					Students will explain what is meant by systems software. Students will explain what is meant by operating system. Students will describe the functions of the operating system. Students will explain what is meant by utility systems software. Students will list some examples of utility systems software and their functions.	• Operating Systems • User Interface • Memory Management and Multi-tasking • Peripheral Management and Drivers • User Management • File Management Throughout, students will be able to demonstrate the purpose and functionality of: • Encryption software • Defragmentation • Data compression • Full and incremental backups Students will develop skills to identify the

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					Students will explain what is meant by a computer network and list the different types of networks. Students will explain describe the difference between client server and peer-to-peer networks. Students will explain the functions of the hardware need to connect computers. Students will explain how computers communicate using cable and microwave.	following types of networks: • LAN (local area network) • WAN (wide area network) Students will develop the skill to justify the different roles of computers in a client-server and a peer-to-peer network. Students will develop the skill to identify the hardware needed to connect stand-alone computers into a Local Area Network. This will include: • Wireless Access Points • Routers/Switches • Network Interface Controller/Card Students will be able demonstrate how transmission media factors affect the performance of

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						networks. In addition, students will be able to demonstrate frequency and channels.
					Students will be able to describe network topologies.	Students will develop the skill of drawing and identifying key features of the following topologies: • Star • Mesh
					Students will be able to explain how users connect to and use the Internet.	Students will develop the skill of identifying the internet as a worldwide collection of computer networks, in particular: • Domain Name Server • Hosting • The Cloud
					Students will be able to explain how data is transmitted across networks.	Students will be able to demonstrate and identify packet switching.
					Students will be able to explain the use of protocols.	Students will develop the skill of identifying the uses of the following: • IP addressing • MAC addressing • TCP/IP

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					Students will be able to explain how virtual networks can be set up.	• HTTP • HTTPS • FTP • POP • IMAP • SMTP Students will be able to demonstrate the benefits of virtual networks as well as the concept through a practical environment.
Understand the impacts of digital technology to the individual and to wider society. The following GCSE Specification Statement will be assessed in: Unit – Ethical, Legal, Cultural & Environmental Concerns					Students will describe the different strategies that criminals use to attack computer networks. Students will explain how people are the greatest security risk to networks. Students will describe the threats posed to networks.	Students will have the skill of identifying and identifying prevention techniques for the following threats posed to a network: • Malware • Phishing Students will be able to suggest appropriate methods for keeping a secure system from a 'weak point' such as people. Students will have the skill in being able to identify the following threats to networks:

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					Students will explain how these threats can be identified, prevented and combatted. Students will explain the role of network policies.	• Brute force attacks • Denial of service attacks • Data interception and theft • SQL injection • Poor network policy Students will develop the skill in identifying, preventing and combatting the following: • Vulnerabilities • Penetration testing • Network forensics • Anti-malware software • Firewalls • User access levels • Password encryption Students will be able to critique pre-existing

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					Students will investigation and discuss the following issues in relation to the development and impact of computer science technologies: • Environmental • Ethical • Legal • Cultural Students will discuss the issues of data collection and privacy. Students will describe the legislation relevant to computer science.	network policies as well as write their own. Students will develop the skill of how-to investigation and discuss Computer Science technologies while considering the following: • Ethical issues • Legal issues • Cultural issues • Environmental issues Students will develop the skill of identifying privacy issues and considering the implications of such issues. Students will develop the skill of interpreting the following legislation and how it is appropriate to computer science: • Data Protection Act 1998 • Computer Misuse Act 1990

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						• Copyright Designs and Patents Act 1988 • Creative Commons Licensing • Freedom of Information Act 2000 • Open source vs proprietary software
To apply mathematical skills relevant to Computer Science. The following GCSE Specification Statement will be assessed in: Unit – Binary Representation Unit – Binary & Hexadecimal			Students will explain how data is represented by computer systems. Students will explain why the binary system is essential for computer processing. Students will develop the mathematical understanding on	Students will develop skills when working with the following computer systems units: • Bit • Nibble • Kilobyte • Megabyte • Gigabyte • Terabyte • Petabyte And how the data needs to be converted into a binary format by processed by a computer. Students will convert positive		

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			how to convert binary numbers into denary a vice versa. Students will develop the mathematical understanding of binary addition, subtraction, multiplication and division on binary numbers. Students will explain why hexadecimal numbers are used.	denary whole numbers (0-255) into 8-bit binary numbers and vice versa. Students will add two 8-bit binary integers and explain overflow errors which may occur. Students will use left and right shift multiplying or dividing binary numbers by powers of 2. Students will develop the skills of converting positive whole numbers (0-255) into 2-digit hexadecimal numbers and vice versa. In addition, students will convert binary to hexadecimal		

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			Students will explain how characters are represented in binary. Students will investigate how binary codes are used to represent characters including: • Character Set • The number of bits per character set and the number of characters which can be represented (ASCII, Extended ASCII and Unicode) Students will explain how images are represented in binary.	equivalents and vice versa. Students will develop the skill of calculating the ASCII code for any character. Students will calculate the size of a text file. Students calculate the size of an image file.		

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			Students will investigate how an image is represented as a series of pixels in binary metadata include in the file: • The effect of colour depth and resolution on the size of an image file. Students will explain how sound is represented in binary. Students will investigate how sound can be sampled and stored in digital form. This will also include: • How sampling intervals and other factors affect the size of a sound file	Students will calculate the size of an audio file.		

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			and the quality of its playback. Students will explain the disadvantages of large image and audio files. Students will explain how file compression reduces the size of files. Students will explain the difference between lossless and lossy file compression.	Students will demonstrate the need for compression and the use of lossless and lossy compression.		