AS Computer Science (Year 12)						
	Autumn Term		Spring Term		Summer Term	
	1	2	1	2	1	2
Key Concepts	• **Characteristics of contemporary processors, input, output and storage devices** • **Programming**	• **Data types, data structures and algorithms** • **Programming**	• **Software** • **Programming**	• **Exchanging data**	• **Software Development**	• **Programming**
Knowledge & Understanding	Students will understand the structure of the processor, including the interaction of the registers in the fetch-decode-execute cycle. They will investigate factors affecting the performance of the CPU and explain the features of Von Neumann and Harvard architectures.	Students will compare the suitability of a range of data types and use binary and hexadecimal number systems to convert denary values and vice versa. They will perform arithmetic on binary numbers and be able to represent text using character sets such as ASCII and UNICODE. Students will continue to develop their programming skills.	Students will understand the functions of an operating system including memory management, interrupts and scheduling algorithms. They will compare different types of operating systems and understand the use of a range of applications, justifying	Students will understand the how data is captured, selected, managed and exchanged. They will investigate the importance of protocols and standards in networks and be able to compare client-server and peer-to-peer networks. Students will use HTML, CSS and JavaScript to create web pages.	Students will use high level programming languages and assembly language to code solutions to problems. They will understand and be able to use a wide range of procedural programming techniques.	Pupils will develop their programming skills and begin their project which forms 20% of the qualification.

	Students will compare different types of processors including their suitability for different scenarios. Students will understand how different input, output and storage devices can be applied to the solution of different problems. Students will use the T.I.M.E approach to programming in Python and be able to carry out programming challenges.		suitable applications for a specific purpose. Students will understand legislation surrounding the use of computers and be able to suggest suitable way to prevent illegal activity. Students will continue to develop their programming skills using Defold.	Students will discuss ethical issues that can or may in the future arise from the use of computers.		
Assessment	End of topic assessments.	End of topic assessments. Mock exams.	End of topic assessments. Mock exams.	End of topic assessments.	End of topic assessments.	Coursework

	Programming assessment.	Programming assessment.	Programming assessment.			
Why this? Why now?	Students must understand that the CPU is the brains of the computer and that all hardware and software interact with the processor. Students must understand that everything we do on a computing device is broken down into single processes that are carried out in billionths of a second. They can then move on to investigate the software that works hand in hand with the hardware.	Students must understand how data is stored digitally. Students have an understanding of the CPU and the FDE cycle They must now understand how data is stored and transferred through Binary 1's and 0's. They should be able to understand that any input is a binary value including character sets which have their own binary and hexadecimal values associated with them. At this point students should be able to write programs to solve small problems and will need to build confidence in their programming skills through a range of	Students need to understand the link between hardware and software and the importance of the operating system in enabling instructions to be processed in the CPU. Students must prepare for their NEA using Defold tutorials to support their programming skills. Students have investigated the internal components of a computing device and how	Students know that data is stored digitally but in this topic they are introduced to the concept of networks and how data is transferred. Students have knowledge of standalone devices but this introduces them to the concept of data being transferred and the risks associated with it.	Students must have an excellent knowledge of programming techniques in order to read, follow and write algorithms in an exam, as well as programming for their project. As the external exams approach, students must have the skills in order to write pseudocode. This is also excellent preparation for designing their project during the next half term.	Students must be confident in their coding ability in order to complete the practical task in the NEA. Students will have completed AS exams by now and will be developing their project ideas for the NEA.

		increasingly more challenging tasks.	input and output devices communicate processes with the CPU. They must now understand the role of the operating system in storing and scheduling processes.			
Skills & Characteristics	• Problem solving • Creativity	• Problem solving • Mathematical skills • Creativity	• Problem solving • Computational thinking	• Creativity • Problem solving • Computational thinking	• Creativity • Problem solving • Computational thinking	• Creativity • Problem solving • Computational thinking
Aspirations & Careers	• Data Analysts • Software Developer • Software Tester • DevOps Engineer • Applications Support					

Computer Science End Points
By the end of Year 12, students will have progressed in a multitude of fields. Beginning with strengthening their programming fundamentals, from basic sequence, selection & iteration to University standard problem-solving techniques. They will be able to identify and build abstract Data structures, such as lists, queues, stacks and hash tables. Students will have built upon their knowledge of how data is represented by computers. They will have investigated a range of legislation specific to digital devices and data such as

the Computer Misuse Act and RIPA. Students will begin to consider project ideas for their coursework element utilising all of the taught skills throughout the year. They will develop a project proposal by, analysing existing systems.

A Level Computer Science (Year 13)

	Autumn Term		Spring Term		Summer Term	
	1	2	1	2	1	2
Key Concepts	• **Characteristics of contemporary processors** • **Types of processor** • **Applications generation** • **Types of programming languages** • **Compression, encryption and hashing** • **Databases** • **NEA**	• **Networks** • **Web technologies** • **Data types** • **Data structures** • **NEA**	• **Boolean Algebra** • **Programming techniques** • **NEA**	• **Computational methods** • **NEA**	• **Algorithms** • **NEA**	
Knowledge & Understanding	Students will understand the structure of the processor, including how pipelining improves efficiency of a processor. Students will compare different types of processors including their suitability for	Students will understand threats to networks that exist and how to prevent them. They will have a good understanding of network hardware used in local/wide area networks.	Students will use the following rules to derive or simplify statements in Boolean algebra: De Morgan's Laws, distribution, association, commutation, double negation.	Students will understand the features that make a problem solvable by computational methods such as problem recognition, problem decomposition, use of divide and	Students will analyse and design algorithms for a given situation. Students will understand measures and methods to determine the efficiency of different algorithms, Big O	

	different scenarios and investigate different uses for GPUs. Students will learn about the different stages of compilation and the use of linkers, loaders and libraries. Students will learn understand and apply skills in a variety of programming paradigms including procedural languages and assembly language where students will write simple programs with the Little Man Computer instruction set Students will learn about different modes of	Students will investigate web technologies including search engine indexing and the PageRank algorithm as well as server and client side processing. Students will further develop their arithmetic skills by learning how to perform floating point binary arithmetic and binary shifts and masks. Students will use data structures to store data: linked-lists, graph (directed and undirected), stacks, queues, trees, binary search trees and hash tables, including how to create, traverse,	Students will use logic gate diagrams and truth tables and learn the logic associated with D type flip flops, half and full adders. Students will understand and apply recursion in their programming. Students will develop their code for the NEA.	conquer, use of abstraction. Students will learn and apply their knowledge of: backtracking, data mining, heuristics, performance modelling, pipelining and visualisation Students will produce the development story for the NEA and carry out testing.	notation (constant, linear, polynomial, exponential and logarithmic complexity). They will compare the complexity of algorithms and understand algorithms for the main data structures, (stacks, queues, trees, linked lists, depth-first (post-order) and breadth-first traversal of trees). Students will perform standard algorithms (bubble sort, insertion sort, merge sort, quick sort, Dijkstra's shortest path algorithm, A* algorithm, binary search and linear search). Students will evaluate their	

	addressing memory. Students will learn about and apply skills in object-oriented languages with an understanding of classes, objects, methods, attributes, inheritance, encapsulation and polymorphism Students will learn about different compressions methods including run length encoding and dictionary coding for lossless compression. They will understand the difference between symmetric and asymmetric encryption, and the different uses of hashing.	add data to and remove data Students will design their program for the NEA.			coded solution for the NEA.	

	Students will learn how to normalise a database into 3NF and use SQL to amend a database. Students will analyse the requirements of the NEA.					
Assessment	End of topic assessments.	End of topic assessments. Mock exams.	End of topic assessments. Mock exams.	End of topic assessments.	End of topic assessments. Coursework	
Why this? Why now?	Students must understand different types of programming languages in order for them to develop their coding skills. They must choose a suitable programming language. Students must understand that	Students must understand how data is stored digitally. Students have an understanding of the CPU and the FDE cycle They must now understand how data is stored and transferred through Binary 1's and 0's. They should be	Students need to understand the link between hardware and software and the importance of the operating system in enabling instructions to be processed in the CPU. Students must prepare for their NEA using Defold	Students know that data is stored digitally but in this topic they are introduced to the concept of networks and how data is transferred. Students have knowledge of standalone devices but this introduces them to the concept of data being transferred	Students must have an excellent knowledge of programming techniques in order to read, follow and write algorithms in an exam, as well as programming for their project. As the external exams approach, students must have the skills in order to write	Students must be confident in their coding ability in order to complete the practical task in the NEA. Students will have completed AS exams by now and will be developing their project ideas for the NEA.

	everything we do on a computing device is broken down into single processes that are carried out in billionths of a second. They can then move on to investigate the software that works hand in hand with the hardware.	able to understand that any input is a binary value including character sets which have their own binary and hexadecimal values associated with them. At this point students should be able to write programs to solve small problems and will need to build confidence in their programming skills through a range of increasingly more challenging tasks.	tutorials to support their programming skills. Students have investigated the internal components of a computing device and how input and output devices communicate processes with the CPU. They must now understand the role of the operating system in storing and scheduling processes.	and the risks associated with it.	pseudocode. This is also excellent preparation for designing their project during the next half term.	
Skills & Characteristics	• Analysis • Problem solving	• Problem solving • Mathematical skills • Creativity	• Problem solving • Mathematical skills • Creativity	• Computational thinking • Problem solving	• Computational thinking • Problem solving	
Aspirations & Careers	• Programmers and software development professionals • Artificial Intelligence data specialist • Aerospace Software Development					

	• Digital & Technology Solutions Specialist • Game Programmer

Computer Science End Points
By the end of Year 13, students will have developed their programming abilities to the point where they can complete their own business-like software project for their NEA. Utilising all the skills learned across KS3, KS4 and KS5, they will be able to confidently describe their solution along with industry standard testing and evaluation. They will be building upon their Year 12 studies of hardware and software into the realm of CPU architecture. Students will be analysing network structures of threats and potential vulnerabilities to systems. Breaking down networks to the operating and utility systems used across a multitude of devices and setups. They will be able to investigate the physical structures of Logic gates and how Boolean algebra allows for complex logically problems to be solved efficiently. Students will by the end of the year have a strong foundation in examination skills, that have been built upon throughout their KS5 journey and will show great resilience when they complete their A-Level examinations in Computer Science.