SUBJECT CURRICULUM INTENT

Vision:
To appreciate the value of learning the key concepts of Computer Science. We want our students to understand the importance of cyber security, keeping themselves safe online, the positive and negative impacts of technology, and how to use technology effectively. The world continues to develop technological advances at an exponential rate, and we believe that we have an important responsibility to ensure that our students are well equipped with the knowledge and skills that will enable them to achieve their potential.
We endeavour for our students to feel empowered and enthused to achieve much more beyond the age of 16.

The sequence of the lessons and topics is vital for the students to be able to understand each concept. We have picked a programming language that is used throughout the industry from NASA , google and YouTube.

The computer science curriculum is structured in units. For the units to be coherent, the lessons within them must be taught in order. The curriculum has been designed to slowly improve the students understanding of the key principles. Our topics will be pitched so that pupils with different starting points can access them although each individual teacher may adapt and change them depending on the group of students. Our lessons will be sequenced so that each builds on prior learning. Our activities will be scaffolded so all children can succeed. We also use a range of scaffolding approaches when teaching programming, exploring some commands or functions, fixing code with bugs to solving specific problems with code.

We have recently adjusted our curriculum as it is clear students need more time studying algorithms and programming so we have introduced these topics at the very start of year 10, to allow those skills to be worked on through the course. Algorithms will further build on the understanding they gained at KS3 when they understood about logic reasoning and flowcharts. This moves the students to build on the foundations from KS3 in programming. This unit will delve further into programming and using python to complete and solve problems

We move onto computer systems, which gives the students a chance to discover more understanding and knowledge about computer systems after the initial unit in Year 8. This follows on to networks and how data is shared between devices. Data representation, databases, ethical and cyber security complete the KS4 schema.

YEAR 10					
	KNOWLEDGE	**CONCEPTS**	**SKILLS**	**RATIONALE**	**PERSONAL DEVELOPMENT**
Term 1	Topic: Algorithms • explain what is meant by the term "algorithm" • explain what is meant by the term "decomposition", and "abstraction" • design an algorithm using pseudocode and flow charts • understand that more than one algorithm can solve the same problem • Compare the efficiency of algorithms explaining how some algorithms are more efficient than others in solving the same problem. • Students need to understand that there is different sort and search algorithms, each with their own strengths and weaknesses.	Programming Problem Solving Logical problem solving	Understanding the main symbols in flowchart or key terminology in pseudocode. Starting at very basic problems, the students will begin tackling the problems by breaking them down, and creating flowcharts or pseudocode. The students will build up to much harder problems, using logical problem solving and algorithms.	This starts off the students journey into KS4 computer science. This builds on KS3 where the students gained the foundations of logical problem solving and solving problems using flowcharts This is a vital topic for the students to understand. One of the key concepts in computer science is logical problem solving, which starts at writing the algorithm. The skills that the use within this topic will be useful through the computer science course. The basics are already embedded so this will build on that understanding and push it further. Before the students can start to program using python, based on problems given to them, them must break the problems down using algorithms. We begin by breaking down basic problems Students will be given a wide variety of problems, and work to try and logically solve it. This will lead them on to the programming unit in their chosen language.	.

YEAR 10				
KNOWLEDGE	**CONCEPTS**	**SKILLS**	**RATIONALE**	**PERSONAL DEVELOPMENT**
Topic : Programming understand the difference between integer, real/float, Boolean, character and string data types understand what variables, constants, sequencing, iteration and selection are and how they are used in programming Understand about Arithmetic, Boolean, Relational operations in a programming language Using programming concepts such as, arrays, input/output, string handling, random numbers, use of subroutines (procedures and functions) Be able to understand how to make and program robust and secure programs and how to test programs	Programming Algorithm Problem solving Logical thinking	Programming concepts including selection, sequence and iteration Understanding how to apply the programming concepts Understanding how computers take different levels of programming and process the information.	Programming is a key concept that the students have been working on since KS3 from Scratch and, Micro Python. The students were taught at key stage 3 how the 3 main constructs are used so this topic will build their knowledge and understanding to be able to solve the problems that they are given. The skills from the topic 1 will be used multiple times such as breaking problems down to allow them to be solved. The students have built themselves up during the algorithms topic, to be able to break down a problem. The students will have a series of lessons looking at all the vital elements of programming. This unit will be completed as all other units with a end of unit assessment, but instead of the retrieval practice as a DO NOW task, students will be allocated 1 lesson every fortnight to completing a programming task to make sure they keep up those vital skills and knowledge	

Term 1/2

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	YEAR 10				
Term 3	Topic: Computer Systems Define the terms "hardware" and "software" Logic Gates/Truth Tables understand the advantages and disadvantages of low-level language programming compared with high-level language programming CPU and its components Hardware/Software including system software, application and utility software Understand how components works within the von Neumann understand the fetch-execute cycle understand the differences between main memory and secondary storage (including RAM and ROM), Fetch decode execute cycle Primary and secondary storage Cloud storage, including embedded and non embedded systems	Binary Logic Programming Computer System Hardware Malware Problem Solving Software	Most of this unit is about understanding how a computer works, understanding the processes it must go through to carry out instructions Higher order thinking skills are used a lot during this topic. Independent learning to close gaps following major summative assessment exam. construct and interpret truth tables and circuit diagrams for logic circuits containing up to 3 logic gates	Computer systems topic has already had basic understanding in topic 1 in year 8. This will now delve deeper into the full system. This topic is important to be before networks and data representation as you need to understand how the computer processes data and instructions before you can and how multiple devices connect with each other Understanding how a computer uses switches will really help them and understand how computers work an knowing this basis will link together the next topics. This will be a great link topic to how computers use switches as they can then start to understand how data is passed between networks, and how text, image and sounds are displayed to the users.	

YEAR 10				
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Term 3	Topic – computer networks Describe the main types of computer network (LAN, WAN and PAN) Understand networks can be wired or wireless, and discuss the advantages and disadvantages of both Describe and construct diagrams of bus and star network topologies, and suggest which would be more appropriate for given situations Define the term "network protocol" describe the 4 layer TCP/IP model, and how common network protocols (TCP, UDP, IP, HTTP, HTTPS, FTP, SMTP, IMAP) work within it Understand that there is different network structures, and topologies Network protocols must be followed for the internet to run smoothly, which is an area that students must learn about Understand network security	Binary Computer System Computer netwroks Hardware Software E Safety Privacy Malware Problem Solving Logic Cyber Security	Most of this unit is about understanding how a network works, understanding the different protocols that must be followed to work correctly. Independent learning to close gaps following major summative assessment exam.	The basics of this topic have been covered in topic 3 in year 8. This leads on well from computer systems. That topic covered how a single computer/device processes information, now the students will learn how multiple devices connect with each other. This topic will teach the students all about the different networks, when and why they are used. Some really important learning will occur in this unit about network security, and leads us on well to the cyber security topic in year 11 Networking has a wide range of careers that the students can choose from so this unit gives them a good understanding about what areas they should focus on.	

YEAR 11				
	KNOWLEDGE	**CONCEPTS**	**SKILLS**	**RATIONALE**	**PERSONAL DEVELOPMENT**

	KNOWLEDGE	**CONCEPTS**	**SKILLS**	**RATIONALE**	**PERSONAL DEVELOPMENT**
Term 1	Topic: Data representation Understand that numbers can be represented in decimal (base 10), binary (base 2) and hexadecimal (base 16) form This includes binary addition, binary shift and why they are used. understand how text is represented in binary using 7-bit ASCII and Unicode, including how characters are grouped together in encoding tables Understand how images and sounds are also represented in binary , alongside compression Compression in files, including RLE and Huffman coding, and why compressing data is useful	Binary Data Representation Computer Network Problem Soling Logic Computer System Hardware Software	Students will need a wide variety of skills in mathematics in this topic. They will be working in 3 number systems (decimal, binary and hexadecimal) and converting between them.	Now the students have a full understanding of a computer system and how it works, it is now time for the students to expand their knowledge from topic 2 in year 8. We will now explore in further detail the finer elements of data representation in computer science This unit of work, brings together a lot of the other topics. Students learned that computers work only with 1 and 0s (electrical currents(so they will now find out in more detail how these switches are used by computers to represent sound images, and character sets etc. We will now step up the basic understanding of binary to decimal conversions, into adding binary, binary shifts and hexadecimal conversions. We will look at how computers compress information and display colours in images.	

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	YEAR 10				
Term 2/3	Topic : SQL Explain the concept of a database. Explain the concept of a relational database. Understand the following database concepts: • table • record • field • primary key • foreign key. Understand that the use of a relational database facilitates the elimination of data inconsistency and data redundancy. Be able to use SQL to retrieve data from a relational database Be able to use SQL to insert data into a relational database Be able to use SQL to edit and delete data in a database	SQL Computer Systems Programming Logic Problem Solving	How to create a relational database How to use SQL successfully within a relational database	This topic will now build on the knowledge that they students gained in Year 9 databases unit. It is the newest unit to be added on the specification for computer science. This will build their database knowledge further including an understanding relational databases. SQL is one of the new topics that has been added to the GCSE. It is a fantastic unit of work that could provide you with lots of job opportunities in the future. Jobs working in SQL continue to grow and the high pay is certainly a bonus. This unit of work will combine a variety of skills from previous topics including logic and programming skills.	

YEAR 10

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE	PERSONAL DEVELOPMENT
Term 2/3	Topic : cyber security define the term "cyber security", and describe its main purpose Understand what penetration testing and how it is used by companies to keep their systems safe describe various forms of social engineering (blagging/pretexting, phishing, pharming and shouldering/shoulder-surfing), describe various forms of malware (viruses, trojans, spyware, adware), Understand various common cyber security measures (biometric measures, password systems, CAPTCHA, email confirmations, automatic software updates)	E Safety Hardware Software Malware Cyber Security Computer system Computer network	Students must be aware of these elements. They will be given a variety of scenarios to apply these to. They must be able to explain how they can stay safe and protect the systems that they use	One of the final topics of the computer science course. The students will now fully understand how a computer works, how a network connects, and how programs can be created, and images/sound displayed. This build on from some topics at KS3. The knowledge from this unit can open up lots of different career pathways. With the technological advances, and so much of our information online we must protect ourselves from the cyber attacks. This unit is not only part of the specification, but it could be the most important unit on the course, as it teaches them security that they	.

YEAR 11

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE	PERSONAL DEVELOPMENT
Term 2/3	Topic 8: Impacts of technology understand the ethical, legal and environmental impacts of modern digital technology (including cyber security, networking, algorithm copyright, theft of computer code, wearable technologies and computer-based implants, data privacy and government surveillance) Students should understand the areas including cyber security, networking, algorithm copyright, theft of computer code, wearable technologies and computer-based implants, data privacy and government surveillance.	Ethical Environmental Malware E Safety Problem solving Computer system Computer network Hardware Software Cyber Security	Be able to structure a 12 mark question, and understand how to approach a discuss question	A really important topic, and one we see as vital for the students as they approach leaving Bedford. This only takes up around 5% of the exam but the understanding of the impacts of technology to the world will be so important as they move through their lives. The final topic, brings together the topics that they had previously been taught, and now asks the students to consider the impacts that those systems and devices have on the world. Impacts to be considered will be ethical, legal and environmental.	