EMMANUEL COLLEGE

THE BUSINESS AND COMPUTING DEPARTMENT

Year 10 Computer Science

Year 10 GCSE Computer Science	**Autumn Term**	**Autumn, Half Term 2/ Spring, Half Term 1**
Unit Title	Computational Thinking	Systems Architecture. Designing, Creating and Refining Algorithms
Key Question(s)?	How are complex real-world programs analysed and interpreted so they can be solved by/solved using computers?	What processes and components are involved in the execution of a command in a computer system? What tools and techniques are employed to try to ensure effective and efficient algorithms are produced, prior to converting them to a program?
Threshold Concepts	Computational thinking is not how computers think, but how people have to think/approach problems in order to produce computerised solutions. Computational thinking involves employing a number of skills including abstraction, decomposition, pattern spotting, generalisation and algorithmic thinking.	The purpose of the CPU is to execute the instructions given in a program. To perform this, it carries out the fetch, decode, execute cycle. Registers hold specific items of data as the fetch, decode, execute cycle is carried out. A register is very small, can only hold one item of data or instruction, with very fast memory located in the processor. Registers include Program Counter (PC), Memory Address Register (MAR), Memory Data Register (MDR), and Accumulator, each of which has a specific, non-varying role in the FDE cycle. Identifying inputs, processes, and outputs for a problem helps to abstract the key information and constructs. Algorithms can be given in: pseudocode, flowcharts, and reference language or high-level programming language, choosing and employing the appropriate one of these will assist in creating, interpreting, correcting, completing, and refining algorithms.
Link to Prior Learning	Computational thinking is the reason computer scientists can break down data in ways that can be represented in binary and specify processes that can be performed by logic circuits which all computer solutions ultimately need to be.	Program instructions, as processed by the CPU are represented in binary. Operations performed by the CPU are completed by logic circuits. CPUs have been developed and improved over the years through the employment of computational thinking. This unit introduces tools that can be employed to support computational thinking and ensure the processes of computational thinking produce effective algorithms.

	Spring Term, Half Term 1/2	Summer, Half Term 1/2	Summer, Half Term 2
Unit Title	Memory and Storage	Networks and Topologies	Wired and Wireless Networks, Protocols and Layers
Key Question(s)?	What is memory and why is it essential in modern computer systems? How does storage differ from memory? What are the most widely used storage types employed in computer systems?	What is a network and why are they employed? What different ways can computer networks be set up and controlled? What are the key pieces of equipment needed to enable computers to be networked?	What transmission media can be used in a network and how do these operate? How is encryption employed to protect data that is sent across a network? How are individual devices on a network identified?
Threshold Concepts	Secondary storage is needed to store programs and data for retrieval at a later date. It is often external to the computer. There are three common forms of storage: Optical, Magnetic and Flash; each operates in a different way and has different performance on a variety of factors including capacity, speed, portability, durability, reliability, cost. These factors must be considered when identifying the most appropriate storage type for a given situation or system.	A network is one or more computers or devices connected together. This allows the sharing of peripherals, such as printers, and software. Networks can be classified as local or wide area. Bandwidth and network latency are key measure of the performance of a network. Networks can be set up as Client-Server or Peer-to Peer and the roles of individual networked machines varies depending on which type of network it is involved in. A network's topology is the arrangement, or pattern, in which all nodes on a network are connected together; there are a number of topologies including star topology, all nodes indirectly, and mesh. The topology of a network will impact its cost to set up, its ease to set up, its efficiency and its ability to handle node failure.	Networks can be classified as wired or wireless. A wired network uses cables; wireless network uses wireless Wi-Fi or Bluetooth signals to connect nodes. Encryption is the process of disguising a message so that it cannot be understood by anyone but its intended recipient. There are many methods of encrypting data. Devices on a network are identified via addressing. Each device on a network will have both an IP address and a MAC address which operate in different ways and serve different purposes. Effective and flexible.
Link to Prior Learning	Use of memory expands the capabilities of the CPU. Modern computer systems could not operate without memory. The CPU and memory form the foundation of a modern computer system. Storage expands the capabilities of the system beyond the programs and data currently in use to store	The functionality of a computer system, CPU, memory and storage can be further enhanced by joining with other devices or computer systems.	This unit moves on from the previous unit's networks and how to establish one to look at the standards and procedures used to enable them to operate.

	previously created information.		
Knowledge and Sequencing Rationale	Employing computational thinking involves developing the skills which require the use of tools and standard approaches hence these need to be formally taught prior to employing CT to develop algorithms and programs. Writing code is a one of the ways students can demonstrate their understanding of the principals of computation. Students need to understand the operations of the CPU in order to appreciate the role and operation of the different types of memory. Computational thinking is at the core of computer science and permeates the creation and modification of every computer system, program, standard, protocol etc. Hence it is essential that students appreciate what it is, its significance and how to employ it at the beginning of the course. As other units are introduced referring back to the operation of the CPU will explain why things happen in the way they do so this needs to be studied earlier in the course. The use of networks devices is ubiquitously and ever-expanding. Understanding the fundamentals of what a network is and can be classified, the equipment needed to establish it, the ways it can be arranged, both physically and hierarchically and the use of internet technologies is essential to the understanding of how computers are employed in our society. Students need an understanding of what a computer system is and the standards and mechanisms (computational thinking, data representation and Boolean logic) before they can understand how they are linked and why network standards are needed. Understanding how networks operate, crucially the concept of layers and related protocols, is a concrete example of decomposition, abstraction and generalisation in operation to solve a physical computing problem. Therefore, studying this is not only essential information for knowing how networks operate but also in recognising the way computational thinking permeates every aspect of computer science.		