CURRICULUM MAP (Long term plan)

SUBJECT: GCSE Computer Science (OCR J277) **YEAR GROUP: 10**

	Cycle 1 **Autumn**	**Cycle 2** **Spring**	**Cycle 3** **Summer**
Substantive knowledge – Essential knowledge & conceptual understanding of the National Curriculum	**01: Computer Systems** 1.2 Memory and Storage **02: Computational thinking, algorithms and programming** 2.4 Boolean Logic 2.1 Algorithms	**01: Computer Systems** 1.1 Systems Architecture 1.2 Memory and Storage	**01: Computer Systems** 1.3 Computer network, connections and protocols 1.4 Network security 1.5 Systems software 1.6 Ethical, legal, cultural and environmental impacts of digital technology
Disciplinary knowledge - what skills are practiced?	**01: Computer Systems** 1.2.3 Units 1.2.4 Data storage 1.2.5 Compression **02: Computational thinking, algorithms and programming** 2.4.1 Boolean Logic 2.1.1 Computational thinking 2.1.2 Designing, creating and refining algorithms 2.1.3 Searching and Sorting algorithms	**01: Computer Systems** 1.1.1 Architecture of the CPU 1.1.2 CPU Performance 1.1.3 Embedded systems 1.2.1 Primary storage (memory) 1.2.2 Secondary storage	**01: Computer Systems** 1.3.1 Network topologies 1.3.2 Wired and Wireless networks, protocols and layers 1.4.1 Threats to computer systems and networks 1.4.2 Identifying and preventing vulnerabilities 1.5.1 Operating Systems 1.5.2 Utility Software 1.6.1 Ethical, legal and cultural and environmental impact
Key questions (What is the learning about?)	The units of data storage: o Bit o Nibble (4 bits) o Byte (8 bits) o Kilobyte (1000 bytes or 1 KB) o Megabyte (1,000 KB) o Gigabyte (1,000 MB) o Terabyte (1,000 GB)	The purpose of the CPU o the fetch-execute cycle Common CPU components and their function: o ALU (Arithmetic Logic Unit) o CU (Control Unit) o Cache o Registers	Types of networks: o LAN (Local Area Network) o WAN (Wide Area Network) Factors that affect the performance of networks The different roles of computers in a client-server and a peer-to-peer network

	o Petabyte (1,000 TB) How data needs to be converted into a binary format to be processed by a computer. Data capacity and calculation of data capacity requirements How to convert positive denary whole numbers to binary numbers (up to and including 8 bits) and vice versa How to add two binary integers together (up to and including 8 bits) and explain overflow errors which may occur How to convert positive denary whole numbers into 2-digit hexadecimal numbers and vice versa How to convert from binary to hexadecimal equivalents and vice versa Binary shifts The use of binary codes to represent characters. The term 'character-set'. The relationship between the number of bits per character in a character set, and the number of characters which can be represented, e.g.:	Von Neumann architecture: o MAR (Memory Address Register) o MDR (Memory Data Register) o Program Counter o Accumulator How common characteristics of CPUs affect their performance: o Clock speed o Cache size o Number of Cores The purpose and characteristics of embedded systems Examples of embedded systems The need for primary storage The difference between RAM and ROM The purpose of ROM in a computer system The purpose of RAM in a computer system Virtual memory The need for secondary storage Common types of storage: o Optical o Magnetic o Solid state	The hardware needed to connect stand-alone computers into a Local Area Network: o Wireless access points o Routers o Switches o NIC (Network Interface Controller /Card) o Transmission media The Internet as a worldwide collection of computer networks: o DNS (Domain Name Server) o Hosting o The Cloud o Webservers and Clients Star and Mesh network topologies Modes of connection: o Wired: • Ethernet o Wireless • Wi-Fi • Bluetooth Encryption IP addressing and MAC addressing Standards Common protocols including: o TCP/IP (Transmission Control Protocol/Internet Protocol) o HTTP (Hyper Text Transfer Protocol) o HTTPS (Hyper Text Transfer Protocol Secure) o FTP (File Transfer Protocol) o POP (Post Office Protocol)

	o ASCII o Unicode How an image is represented as a series of pixels, represented in binary Metadata The effect of colour depth and resolution on: o The quality of the image o The size of an image file How sound can be sampled and stored in digital form The effect of sample rate, duration and bit depth on: o The playback quality o The size of a sound file The need for compression Types of compression: o Lossy o Lossless Principles of computational thinking o Abstraction o Decomposition o Algorithmic Thinking. Identify the inputs, processes, and outputs for a problem Structure diagrams	Suitable storage devices and storage media for a given application The advantages and disadvantages of different storage devices and storage media relating to these characteristics: o Capacity o Speed o Portability o Durability o Reliability o Cost	o IMAP (Internet Message Access Protocol) o SMTP (Simple Mail Transfer Protocol) The concept of layers Forms of attack o Malware o Social engineering, e.g. phishing, people as the 'weak point' o Brute-force attacks o Denial of service attacks o Data interception and theft o The concept of SQL injection Common prevention methods: o Penetration Testing o Anti-malware software o Firewalls o User access levels o Passwords o Encryption o Physical Security Impacts of digital technology on wider society including: o Ethical issues o Legal issues o Cultural issues o Environmental issues o Privacy issues Legislation relevant to Computer Science: o The Data Protection Act 2018 o Computer Misuse Act 1990 o Copyright Designs and Patents Act 1988 o Software licences (i.e. open source and proprietary)

	Create, interpret, correct, complete, and refine algorithms using: o Pseudocode o Flowcharts o Reference language /high-level programming language Identify common errors Trace tables Standard searching algorithms: o Binary search o Linear search Standard sorting algorithms: o Bubble sort o Merge sort o Insertion sort Simple logic diagrams using the operations AND, OR and NOT Truth tables Combining Boolean operators using AND, OR and NOT Applying logical operators in truth tables to solve problems		The purpose and functionality of operating systems: o User interface o Memory management and multitasking o Peripheral management and drivers o User management o File management The purpose and functionality of utility software Utility system software: o Encryption software o Defragmentation o Data compression
Assessment Live marking is conducted throughout lessons with verbal feedback and feedback cards given out to students.	HT 1: End of topic (EOT): written paper: Boolean Logic HT 1: EOT written paper: Units, Data storage, Data representation, Compressions	HT 1: EOT written paper: Architecture of the CPU, CPU Performance, Embedded systems, HT2: Primary storage (memory), Secondary storage	HT 1: EOT written paper: Network topologies, Wired and Wireless networks, protocols and layers, Threats to computer systems and networks, Identifying and preventing vulnerabilities

	HT2: EOT written paper: Computational thinking, Designing creating and refining algorithms, Searching and sorting algorithms.		HT 2: EOT written paper: Operating Systems, Utility Software, Ethical, legal and cultural and environmental impact
Literacy (L),**Numeracy** (N), **Oracy** (O) **opportunities**	Comparison and Logical operators used in computing (N) Understanding of boolean expressions (N) Calculations using computing units, binary, hexadecimal (N) Use of flowchart shapes (N) Define and describe key terms (L)	Calculations using computing units, binary, hexadecimal (N) Define and describe key terms (L)	Define and describe key terms (L)
Cross Curricular Opportunities	Maths - use of BIDMAS, arithmetic and operators Music - understanding of analogue sound stored as digital sound	Maths - use of BIDMAS and arithmetic	Citizenship - the legal, ethical and environmental impacts and obligations in the digital world.
Super curriculum	KS3/4 Computing Club YouTube Channels: Craig n Dave - https://www.youtube.com/channel/UC0HzEBLlJxlrwBAHJ5S9JQg MrBrownCS - https://www.youtube.com/@ComputerScienceTutor Seneca Learning eRevision BBC Bitesize - https://www.bbc.com/bitesize/subjects/z34k7ty		
Careers	**HT 1:** Sound Engineer, Storage engineer	**HT1:** Computer Architect	**HT1:** Network Engineer

	HT 2: Programmer (a range of careers require computational thinking)	**HT2:** System administrator	**HT2:** Penetration tester / Hacker
Equality and Diversity Gender Disability Religion Race Sexuality	'I Belong Display' shows a variety computer scientists of different genders and from different race	'I Belong Display' shows a variety computer scientists of different genders and from different race	'I Belong Display' shows a variety computer scientists of different genders and from different race
Local Community Links			
British Values British Values Democracy The rule of Law Individual Liberty Mutual Respect and Tolerance of others SMSC Character Education	Within lessons learners have the opportunity to contribute to discussions, have their opinions heard, view other learners' work and give them feedback. Students are encouraged to allow everyone to have their say on particular topics and also how to present different pieces of work. Learners are taught how to use the Internet safely, at school and at home, and how to report any images/messages deemed to be inappropriate. Learners are encouraged to make choices, safe in the knowledge they are in a safe and supportive environment. The school provides boundaries for the children to make choices safely. Learners are taught about their etiquette online and how to engage in an online community positively.		