Building an integrated curriculum from KS3 learning

Malbank School follows the Eduschemes curriculum at KS3. This sets a solid foundation for learners to achieve at KS4, in both ICT related qualifications and Computer Science. For the latter, the KS3 curriculum is built upon as follows:

Algorithms (sorting and searching)

The principles behind sorting and searching are refined. Additional types of algorithms are introduced.

Programming

In KS3, students learn basic Python, Small Basic and HTML/CSS scripting. The concepts learned are developed into more complex Python programs using multiple types of programming constructs.

Number systems

4-bit binary is covered at KS3, which is then developed into 8 bit binary and hexadecimal.

Hardware

In KS3 students develop an understanding of hardware components, such as memory and storage. At KS4 they develop a detailed understanding of how a CPU functions, including the use of registers and buses.

Networks

At KS3, children gain an appreciation of some of the components of networking. Their knowledge is enhanced at KS4 to include

GCSE 9-1 (J276) Computer Science					
			HEAD	HEART	HAND

1.1	Architecture	What is a computer system?	Computer system Input, process, output, storage Data bus Embedded computer	Resilience Organisation Communication	Will be required to solve ICT work issues independently.
			Control unit ALU Registers Cache Clock	Motivation Resilience Independence	Will be encouraged not to seek help when solving certain problems.
		The purpose and components of the CPU	Von Neumann architecture MAR & MDR Program Counter Accumulator Harvard architecture	Independence Motivation Communication	Must have good file management skills.
		Fetch-Decode-Execute cycle	Registers involved Fetch, decode, execute cycle	Resilience Organisation Communication	Opportunities to iscuss developments with their work and to work in a team.
			Clock speed Multi-core processors Cache RAM Graphics GPU	Motivation Resilience Independence	Will be required to solve ICT work issues independently.

1.2	Memory	CPU performance factors	Main memory Volatile memory - what is it? RAM DRAM SRAM ROM Virtual memory	Independence Motivation Communication	Keep going even though learning the different languages can be demanding for many.
1.3	Storage		Storage media & devices Magnetic storage Optical storage Solid state media Data capacity Calculating storage	Resilience Organisation Communication	Walk-through sections of code with other individuals.
1.4	WiFi and Wired networks	Memory types	What is a network? Home networks Business networks LANs WANs	Motivation Resilience Independence	Will be required to solve ICT work issues independently.
			Bandwidth Wired performance Bands and channels Wi-Fi performance Error rate Latency	Independence Motivation Communication	Will be encouraged not to seek help when solving certain problems.
		Secondary storage	Client server networks Peer-to-peer networks	Resilience Organisation Communication	Must have good file management skills.

			NIC Hub Switch Router Cables WAP and Wi-Fi	Motivation Resilience Independence	Opportunities to iscuss developments with their work and to work in a team.
		Types of networks	ISP URL IP address DNS Web sites Local hosting External hosting The Cloud	Independence Motivation Communication	Will be required to solve ICT work issues independently.
			Standard networks Virtual networks	Resilience Organisation Communication	Keep going even though learning the different languages can be demanding for many.
1.5	Networks	Performance of networks	Star network Mesh network	Motivation Resilience Independence	Walk-through sections of code with other individuals.
		Client/Server and Peer-to-Peer	Protocols TCP/IP HTTP / HTTPs FTP POP, IMAP, SMTP Ethernet	Resilience Organisation Communication	Will be required to solve ICT work issues independently.

			The four layer model		
			Circuit switching Packet switching	Motivation Resilience Independence	Will be encouraged not to seek help when solving certain problems.
1.6	Network security	Hardware needed	Network security Why is it important?	Independence Motivation Communication	Must have good file management skills.
			Malware Social engineering Phishing Brute force Denial of service Data interception SQL injection Poor network policy	Resilience Organisation Communication	Opportunities to iscuss developments with their work and to work in a team.
		DNS, IP addressing, web hosting and the cloud	Malware Viruses Worms Browser malware	Motivation Resilience Independence	Will be required to solve ICT work issues independently.
			User access rights Passwords Network policy Acceptable use policy	Independence Motivation	Keep going even though learning the different languages can be demanding

			Backups Disaster recovery Network forensics Anti-malware Firewall Penetration testing Encryption	Communication	for many.
1.7	Systems Software	Virtual Networks	Kernel User interface Memory management Multi-tasking OS Device drivers User management	Resilience Organisation Communication	Walk-through sections of code with other individuals.
			Encryption utilities Defragmentation utilities Compression Backup Information & diagnostics	Motivation Resilience Independence	Will be required to solve ICT work issues independently.
1.8	Ethical and legal	Network topologies	Data Protection Act General Data Protection Regulation (GPDR) Computer Misuse Act Copyright, Designs & Patents Act Freedom of Information Act	Independence Motivation Communication	Will be encouraged not to seek help when solving certain problems.
			Ewaste Sustainability Recycling Energy Monitoring Stakeholders	Resilience Organisation Communication	Must have good file management skills.

			DNA profiling National Identity cards CCTV Electronic tracking Personal data Stakeholders	Motivation Resilience Independence	Opportunities to iscuss developments with their work and to work in a team.
		Protocols	Digital divide Genetic screening Whistleblowers Self driving cars Drone warfare	Independence Motivation Communication	Will be required to solve ICT work issues independently.
			Anonymity Social media Health Citizen journalism Viral videos	Resilience Organisation Communication	Keep going even though learning the different languages can be demanding for many.
		Packet Switching	Open source Closed source Creative Commons	Motivation Resilience Independence	Walk-through sections of code with other individuals.
2.1	Algorithms		Decomposition Top-down diagrams Pattern recognition Abstraction Algorithms	Independence Motivation Communication	Will be required to solve ICT work issues independently.

		Introduction to network security	Algorithms Pseudocode Precision Keywords Operators & variables Conditionals Loops	Resilience Organisation Communication	Will be encouraged not to seek help when solving certain problems.
			Algorithms Flowcharts Flowchart shapes	Motivation Resilience Independence	Must have good file management skills.
		Network threats	Bubble sort Insertion sort Merge sort	Independence Motivation Communication	Opportunities to iscuss developments with their work and to work in a team.
			Searching Data sets and criteria Linear search Binary search	Resilience Organisation Communication	Will be required to solve ICT work issues independently.
2.2	Programming Techniques	Malware	Variables Constants Arithmetic operators Boolean operators Assignment operators Compound operators	Motivation Resilience Independence	Keep going even though learning the different languages can be demanding for many.

			One dimensional arrays Static arrays Dynamic arrays Iterations Two dimensional arrays Array functions	Independence Motivation Communication	Walk-through sections of code with other individuals.
		Preventing vulnerabilities	Sequence Selection Conditionals -IF Conditionals - CASE Iteration WHILE DO FOR	Resilience Organisation Communication	Will be required to solve ICT work issues independently.
			Assignment & storage Copy & concatenate Traversal Search Casting	Motivation Resilience Independence	Will be encouraged not to seek help when solving certain problems.
		Operating System	Open Close Write Write loop Read Read loop	Independence Motivation Communication	Must have good file management skills.
			Database parts SQL SELECT WHERE WHERE ... AND WHERE ... FOR LIKE	Resilience Organisation Communication	Opportunities to iscuss developments with their work and to work in a team.

		Utility software	Character & string Integer Real Boolean	Motivation Resilience Independence	Will be required to solve ICT work issues independently.
			Repeating code Subprocedures Functions Code Library	Independence Motivation Communication	Keep going even though learning the different languages can be demanding for many.
2.3	Producing robust programs	Legislation	User interfaces Screen widgets Repeat entry Input boxes Validation Whitelist & blacklist Sanitising Authentication	Resilience Organisation Communication	Walk-through sections of code with other individuals.
			Comments Headers Whitespace Indentation	Motivation Resilience Independence	Will be required to solve ICT work issues independently.
		Environment	Logic errors Arithmetic order Syntax errors Debugging tools Run-Time errors	Independence Motivation Communication	Will be encouraged not to seek help when solving certain problems.

			Test plan Test data Black box strategy White box strategy Iterative testing Final testing	Resilience Organisation Communication	Must have good file management skills.
•		Privacy & technology			
2.4	Computational Logic		What is logic Binary logic Truth tables Logic gates **Applying maths is in section 2.2**	Independence Motivation Communication	Will be required to solve ICT work issues independently.
		Ethics & technology			
2.5	Translators and facilities of languages	Culture & technology	Machine code Assembly code High level language Translators Assemblers Compilers Interpreters IDE		Will be required to solve ICT work issues independently.
2.6	Data Represenation		Bit, nibble, byte Kilobyte, megabyte, gigabyte Terabye, petabyte	Resilience Organisation Communication	Will be encouraged not to seek help when solving certain problems.

		Open source and closed source	Number systems Digit position Denary to binary Binary to denary Adding binary Binary shift Binary overflow	Motivation Resilience Independence	Must have good file management skills.
			Hexadecimal symbols Denary to Hexadecimal Hexadecimal to denary Binary to hexadecimal Hexadecimal to binary Check digits	Independence Motivation Communication	Opportunities to iscuss developments with their work and to work in a team.
		Computational thinking	ASCII Extended ASCII Character sets Unicode	Resilience Organisation Communication	Will be required to solve ICT work issues independently.
			Input devices Pixels Greyscale Colour Colour depth Resolution Metadata	Motivation Resilience Independence	Keep going even though learning the different languages can be demanding for many.
		Pseudocode	Sampling Storing Sampling frequency Sampling bit depth Channels Bit rate Metadata	Independence Motivation Communication	Walk-through sections of code with other individuals.

			Lossy compression Lossless compression	Resilience Organisation Communication	Will be required to solve ICT work issues independently.