Share Multi Academy Trust

Curriculum Plan

Subject:	OCR GCSE Computer Science	Year	10	Ability	All

Term / Date(s)	Topic 4 (6-8 weeks)	Topic 5 (4-6 Weeks)	Topic 6 (3-4 Weeks)	Topic 7 (8-10 Weeks)
Topic	Computer networks, connections and protocols	Network security	Systems software	Programming Fundamentals and Producing robust programs
Topic overview **Pupils will learn…**	In this topic, students will learn about computer networks and their importance in the modern world we live in. They look at how networks are formed and how data travels around them via packets, addressing and different protocols.	In this topic, students will learn that computer systems are vulnerable to attack from many places and that attacks come in many different shapes and forms, but there are a number of preventative measures that are available to network administrators and cyber security departments.	In this topic, students will learn that computers use and need systems software in order to function and that this is broken down in to the operating system and utilities, each of which has a vital role to play in the computer system.	In this topic, students will learn how to formulate programs in order to solve problems. They will use the computational thinking fundamentals to analyse problems and create programs to meet the needs of these using common programming fundamentals, data types and additional programming techniques using Python.
Components	Students will learn and understand about: **Networks and Topologies** • The characteristics of LANs and WANs including common examples of each. They must also understand the different factors that can affect the performance of a network, e.g. Number of devices connected, Bandwidth and the tasks performed by each piece of hardware. They must understand the advantages and disadvantages of the Star and Mesh topologies and apply understanding of networks to a given scenario. They must also understand the concept of the Internet as a network of computer networks, including a DNS's role in the conversion of a URL to an IP address, the concept of servers providing services (e.g. Web server " Web pages, File server " file storage/retrieval),the concept of clients requesting/using services from a server, the Cloud as a remote service provision (e.g. storage, software, processing) including advantages and disadvantages. **Wired and wireless networks, protocols and layers** • Compare benefits and drawbacks of wired versus wireless connection and recommend one or more connections for a given scenario. They must also understand the principle of encryption to secure data across network connections, how IP and MAC address is used to identify devices on a network and the format of an IP address (IPv4 and IPv6). They must also understand the principle of a standard to provide rules for areas of computing that allows hardware/software to interact across different manufacturers/producers. Thy must also understand the principle of a (communication) protocols as a set of rules for transferring data, that different types of protocols are used for different purposes. And that layers are used in protocols, and the benefits of using layers and the 4-layer TCP/IP model. They should be able to recall this information in order to apply it to given scenarios.	Students will learn and understand about: **Threats** • A wide range of threats to data and computer systems, in order to demonstrate their knowledge of the principles that different forms take, how they attack, the damage they do and ways in which they spread. **Prevention methods** • How to limit threats posed to data and computer systems, in order to demonstrate their understanding of methods to remove vulnerabilities. The must have a knowledge of the principles of each prevention method, what each prevention method may limit/prevent and how it limits the attack. They should be able to recall this information in order to apply it to given scenarios and suggest appropriate prevention methods based upon the form of attack.	Students will learn and understand about: **<u>Operating systems</u>** – in order to discuss each of the following and the impacts and effects each can have on a system: • Each function of an operating system and what it does, including the features of a user interface, memory management (the transfer of data between memory) and how this allows for multitasking. • How data transfer between devices and the processor needs to be managed and what this entails (e.g. the use of buffers when transferring data to a printer). • User management functions, including allocation of an account, access rights and security. • File management and the key features, including naming, allocating to folders, moving files and saving. **<u>Utility Software</u>** – in order to discuss each of the following and the impacts and effects each can have on a system: • An understanding that computers often come with utility software, including disk defragmentation, encryption and compression software and how these performs housekeeping tasks, including their purpose, why they are required and how they work.	Students will learn, understand about and demonstrate: **<u>Programming fundamentals</u>** • Their ability to identify and use variables, constants, operators, inputs, outputs and assignments, random number generation, alongside the programming constructs, sequence, selection and iteration in order to create effective programs. • Their ability to identify and use common arithmetic, comparison and Boolean operators and practically data types in a high-level language in order to choose suitable data types for data in a given scenario and understand that data types may be temporarily changed through casting, and where this may be useful. • Their ability to identify and use basic string manipulation and file handling operations in order to accurately alter and amend data within a program. • Their ability to identify and use arrays (or equivalent) when solving problems, including both one-dimensional and two-dimensional arrays, in order to understand that data can be stored as larger sets of data that relate to each other. • Their ability to identify and use sub programs (functions and procedures), within larger programs in order to produce more structured code. **<u>Maintainability</u>** • Their ability to identify and use sub programs, naming conventions, indentation and commenting in order to create efficient, effective and easier to maintain programs. **<u>Defensive Design</u>** • Their ability to identify and use programming validation and verification techniques in order to show understanding of the issues a programmer should consider to ensure that a program caters for all likely input values and how to deal with invalid data in a program. **<u>Testing</u>** • Their ability to identify and correct program syntax and logic errors in order to produce correctly working systems for a given scenario. **<u>Programming task</u>** • Their ability to design, write, test and refine high-level, text-based programming language programs, in order to undertake a programming task during the course of their study. Practical Programming skills will then be assessed in Component 2 of the qualification.

What pupils should already know **(prior learning components)**	In Key stage 3, students have learnt about computer systems and networks and how data is transmitted between devices.	In Key stage 3 students have learnt about different computer malware and various cyber security threats and prevention methods, including unauthorised access, malware, brute force, encryption, passwords, anti-malware.	In key stage 3, students will have briefly looked at the operating system and its role on the computer.	Students have covered elements of Python Programming in Year 8 and 9, so should have some initial knowledge and understanding of Python programming language.
Transferrable knowledge (skills)	Students must be able to recall any information regarding networks, topologies, protocols and layers in order to apply it to any given scenario within the exam. Networks links to Network security as to the protection methods that must be employed to keep them safe from a range cyber threats.	Students must be able to recall any information regarding threats and prevention methods in order to apply it to any given scenario in the exam and also suggest the most appropriate method of protection for any particular threat. Network security links to Networks as to the protection methods that must be employed to keep them safe from a range cyber threats.	Students must be able to recall any information regarding operating systems and utilities in order to apply it to any given scenario within the exam and explain how they work and the impacts each can have on systems, users and files. Operating systems links to systems architecture with regards multitasking and data transfer between the processor and devices. Utility software links to Memory and storage and systems security with regards compression software and encryption.	Their ability to design, write, test and refine high-level, text-based programming language programs, in order to undertake a programming task during the course of their study. They must also be able to use these skills during the exam to design, write, test and refine algorithms written in pseudocode, flow diagrams and high-level programming language. **Programming fundamentals:** • The use of variables, constants, operators, inputs, outputs and assignments. • The use of the programming constructs used to control the flow of a program • The common arithmetic operators • The common Boolean operators AND, OR and NOT • The use of data types (Integer, Real, Boolean, Character and string, Casting) • The use of basic string manipulation. • The use of basic file handling operations (Open, Read, Write, Close) • The use of arrays (or equivalent) when solving problems, including both one-dimensional and two-dimensional arrays. • How to use sub programs (functions and procedures) to produce structured code. • Random number generation **Defensive design** • Considerations (Anticipating misuse, Authentication, Input validation) **Maintainability:** • Use of sub programs • Naming conventions • Indentation • Commenting **Testing** • Identify syntax and logic errors IDEs and Facilities of Language •
Key Vocabulary	Network, LAN, WAN, Share, Client, Server, Workstation, Topology, Star Mesh, NIC, Hub/Switch, Router, Ethernet Cable, WAP, Bandwidth, Users, Obstacles, Interference, Distance, the Internet, WWW, Data Packets, Packet Switching, protocol, Ethernet, wi-fi, layers, encryption.	Malware, viruses, Trojan, Worm, Spyware, Social engineering, phishing, blagging, shouldering, Brute-force attacks, Denial of service attacks, Data interception and theft, SQL injection, Penetration testing, Anti-malware software, Firewalls, User access levels, Passwords, Encryption, Physical security.	System software, operating system, utilities, user interface (Graphical, command line, menu, WIMP), Memory management and multitasking, peripheral management and drivers, User management, file management, Encryption software, Defragmentation and Data compression.	Python, Programming, syntax, variables, constants, operators, inputs, output, assignments, Sequence, Selection, Iteration, operators, data types, string, integer, float, Boolean, array, sub, syntax error, logic errors
Assessment activities	Starter and plenary mini assessments End of unit tests (40mins at the end of each unit) Use of online assessments (forms, Kahoot, quizizz) Content covered is used within the PPG assessments in the form of an exam style paper using past exam questions from the exam board.	Starter and plenary mini assessments End of unit tests (40mins at the end of each unit) Use of online assessments (forms, Kahoot, quizizz) Content covered is used within the PPG assessments in the form of an exam style paper using past exam questions from the exam board.	Starter and plenary mini assessments End of unit tests (40mins at the end of each unit) Use of online assessments (forms, Kahoot, quizizz) Content covered is used within the PPG assessments in the form of an exam style paper using past exam questions from the exam board.	Starter and plenary mini assessments Python Challenge activities. Programming assignment (old spec scenarios) Use of online assessments (forms, Kahoot, quizizz) Content covered is used within the PPG assessments in the form of an exam style paper using past exam questions from the exam board.
Resources available	• Lesson Resources: I:\Maths and Computing\ICT\OCR Computer Science • SOW: I:\Maths and Computing\ICT\Curriculum • CGP Revision Guide - 178908556X • Online: ○ BBC Bitesize ▪ Wired and wireless networks ▪ Network topologies, protocols and layers ○ Teach-ICT.com ▪ Network types ▪ Performance factors ▪ Roles	• Lesson Resources: I:\Maths and Computing\ICT\OCR Computer Science • SOW: I:\Maths and Computing\ICT\Curriculum • CGP Revision Guide - 178908556X • Online: ○ BBC Bitesize – Systems Security ○ Teach-ICT.com ▪ Threats Protection	Content covered from all unit 1 content is used within the Year 11 Mock assessment in the form of an exam style paper using past exam paper from the exam board. • Lesson Resources: I:\Maths and Computing\ICT\OCR Computer Science • SOW: I:\Maths and Computing\ICT\Curriculum • CGP Revision Guide - 178908556X • Online: ○ BBC Bitesize – Systems Software ○ Teach-ICT.com ▪ Operating System • Utilities	• Lesson Resources: I:\Maths and Computing\ICT\OCR Computer Science • SOW: I:\Maths and Computing\ICT\Curriculum • CGP Revision Guide - 178908556X • Online: ○ BBC Bitesize ▪ Programming constructs ▪ Programming techniques ▪ Producing robust programs ○ Teach-ICT.com ▪ Variables and others ▪ Arrays ▪ Sequence, Selection, Iteration

	▪ Hardware ▪ Internet technology ▪ Topologies ▪ Modes of connection ▪ Encryption ▪ IP and MAC addresses ▪ Protocols and layers			▪ Data types ▪ String manipulation ▪ File handling ▪ SQL ▪ Functions and subroutines ▪ Random numbers ▪ Defensive design ▪ Maintainable code ▪ Spotting errors
Notes **Why this topic is important…**	In today's world computers and networks have become an integral part of our lives, including the business sector for professional activities. As technologies have evolve computer networks will play a greater role in everyday lives and their importance and reliability will continue to grow. Understanding how networks work and allow us to perform our day to day lives is a key skill that every student needs.	Network security is important because it encompasses everything that relates to protecting our data from cyber attackers who want to steal this information and use it to cause harm. This can be sensitive data, governmental and industry information, personal information, personally identifiable information (PII), intellectual property, and protected health information (PHI).	An operating system is the most important software that runs on a computer. It manages the computer's memory and processes, as well as all of its software and hardware. It also allows you to communicate with the computer without knowing how to speak the computer's language. Without an operating system, a computer is useless.	Computer programming has become a sought-after skill even for positions that aren't involved directly in computer science. Those who can talk to machines—even just a little—will find their resumes stand out in the job field, like language skills or communication skills. Students entering a job field will find computer programming skills necessary to maintain and troubleshoot these automation tools. Computer programming ensures that students have access to the creative, fast-paced world that relies on machine connections. Students can apply these skills to many different industries and disciplines.