GCSE Computer Science Programme of Study

Students will follow the OCR J277 specification. They will have 2 lessons per week of theory and one of practical programming.

Theory Topic	Topic Breakdown	Programming
1.2 Memory	• 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 use of variables, constants, operators, inputs, outputs and assignments • The use of the three basic programming constructs used to control the flow of a program: o Sequence o Selection o Iteration (count- and condition-controlled loops) • The common arithmetic operators • The common Boolean operators AND, OR and NOT • The use of data types: o Integer o Real o Boolean o Character and string o Casting • The use of basic string manipulation • The use of basic file handling operations: o Open o Read o Write o Close

		• The use of records to store data • The use of SQL to search for data • The use of arrays (or equivalent) when solving problems, including both one-dimensional (1D) and two-dimensional arrays (2D) • How to use sub programs (functions and procedures) to produce structured code • ¨Random number generation
1.2 Secondary Storage	• The need for secondary storage • Common types of storage: • Optical • Magnetic • Solid state • 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	

	○ Cost	
1.2 Data Representation	• The units of data storage: o Bit o Nibble (4 bits) o Byte (8 bits) o Kilobyte (1,000 bytes or 1 KB) o Megabyte (1,000 KB) o Gigabyte (1,000 MB) o Terabyte (1,000 GB) 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 binary integers to their hexadecimal equivalents and vice versa • Binary shifts	

	• Characters • 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.: o ASCII o Unicode • Images • 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 • Sound • 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	

2.4 Boolean Logic	• Simple logic diagrams using the operators AND, OR and NOT • Truth tables • Combining Boolean operators using AND, OR and NOT • Applying logical operators in truth tables to solve problems	
1.1 System Architecture	• 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 • 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	
2.5 Programming Languages and IDEs	• Characteristics and purpose of different levels of programming language: o High-level languages o Low-level languages • The purpose of translators • The characteristics of a compiler and an interpreter • Common tools and facilities available in an Integrated • Development Environment (IDE): o Editors o Error diagnostics o Run-time environment o Translators	

1.4 Network Security	• 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	
2.1 Algorithms	• Principles of computational thinking: o Abstraction o Decomposition o Algorithmic thinking • Designing, creating and refining algorithms • Identify the inputs, processes, and outputs for a problem • Structure diagrams	

	• 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	
1.5 System Software	• 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 o Utility system software: o Encryption software	

	o Defragmentation o Data compression	
2.3 Producing Robust Programs	• Defensive design considerations: o Anticipating misuse o Authentication • Input validation • Maintainability: o Use of sub programs o Naming conventions o Indentation o Commenting • The purpose of testing • Types of testing: o Iterative o Final/terminal • Identify syntax and logic errors • Selecting and using suitable test data: o Normal o Boundary o Invalid/Erroneous • Refining algorithms	

1.3 Networks	• Types of network: 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 • 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 Web servers and clients • Star and Mesh network topologies • Modes of connection: o Wired o Ethernet	

	o Wireless o Wi-Fi o Bluetooth o 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 IMAP (Internet Message Access Protocol) o SMTP (Simple Mail Transfer Protocol) • The concept of layers	

1.6 Legislation and Ethics	• 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)	