KS4 Curriculum Overview: Computer Science (GCSE)

Year 1 GCSE/BTEC Option Subjects

TERM 1 TOPIC/s	*Key Skills/Subject Links	*Career links & BV
• Introduction to programming and course • Decomposition, algorithms • Binary • Data types, variables, unsigned integers • Input and integer functions, debugging tools and binary arithmetic • Flowcharts, Two's Complement	**Key skills:** ▪ Planning and implementing algorithms/ programs. ▪ Debugging syntax errors ▪ Critical thinking and problem solving skills. ▪ Performing arithmetic conversions. ▪ Designing and creating flowcharts **Subject links:** ▪ Mathematics: Application of mathematical concepts- converting between number systems. ▪ Business studies- flowcharts can be used to visualise sequence of steps involved in business processes and decisions. ▪ Science- flowcharts can be used to visualise sequence of steps involved in experiments.	**Career links:** Several careers make use of python programming including: • Software developer engineer: python is widely used in web development. • Data scientist: Python is a popular programming language for machine learning and data analysis. • Cybersecurity analyst: Python is used for tasks such as analysing security data and building security tools. • Game developer: Python can be used to create video games. British Values: • Democracy: Supports data-driven decision-making and transparency in various sectors. • Rule of Law: Emphasizes the importance of accurate and lawful data storage and management. • Individual Liberty: Empowers individuals with data analysis, planning and programming skills for personal and professional use. • Tolerance of Different Faiths and Beliefs: Encourages diverse perspectives in data interpretation and analysis.

TERM 2 TOPIC/s	*Key Skills/Subject Links	*Career links & BV
• String manipulation, string methods, continuing with Two's complement • If/if else, relational operators, logical binary shifts • If/elif/else, readability, arithmetic binary shifts • Boolean operators, hexadecimal • Repetition (while loop), ASCII	**Key skills:** ▪ Performing arithmetic conversions ▪ Constructing logic gates ▪ Planning and implementing algorithms using selection. ▪ Debugging syntax and logic errors ▪ Critical thinking and problem solving. **Subject links:** ▪ Mathematics: Application of mathematical concepts e.g. converting between number systems and using operators.	**Career links:** Several careers make use of python programming including: • Software developer engineer: python is widely used in web development. • Data scientist: Python is a popular programming language for machine learning and data analysis. • Cybersecurity analyst: Python is used for tasks such as analysing security data and building security tools. • Game developer: Python can be used to create video games. **British Values:** • Democracy: Supports data-driven decision-making and transparency in various sectors. • Rule of Law: Emphasizes the importance of accurate and lawful data storage and management. • Individual Liberty: Empowers individuals with data analysis, planning and programming skills for personal and professional use. • Tolerance of Different Faiths and Beliefs: Encourages diverse perspectives in data interpretation and analysis.
TERM 3 TOPIC/s	***Key Skills/Subject Links**	***Career links & BV**

• CPU – FDE cycle • The registers in the Von Neumann architecture. • Common CPU components • Function of cache • Characteristics affecting CPU • Embedded systems • Primary storage • Virtual memory • Secondary storage types • Secondary storage characteristics • Programming Fundamentals • Sequence and Selection • Iteration	**Key skills:** ▪ Planning and implementing algorithms/programs ▪ Debugging syntax and logic errors ▪ Logical reasoning **Subject links:** ▪ Mathematics: using mathematical concepts can enrich problem solving skills- crucial for programming and data storage. ▪ Physics and electronics: these help provide a foundational understanding of storage devices and other hardware components.	**Career links:** As well as the programming careers above several careers involve storage and maintaining data such as: • Storage administrator • Data storage architect • Backup and recovery specialist • Cloud storage engineer Several careers can benefit from learning computer hardware such as: • Hardware technician • Network engineer • Network administrator • IT manager **British values:** • Democracy: Supports decision-making in justifying the most appropriate secondary storage technologies. • Rule of Law: Emphasizes the importance of accurate and lawful data storage and management. • Tolerance of Different Faiths and Beliefs: Encourages diverse perspectives in data interpretation and analysis.
TERM 4 TOPIC/s	▪ ***Key Skills/Subject Links**	***Career links & BV**
• Units and binary numbers • Binary arithmetic and hexadecimal • Characters • Programming fundamentals • Arrays	**Key skills:** ▪ Planning and implementing algorithms/programs, ▪ Converting between number systems ▪ Debugging syntax and logic errors ▪ Critical thinking and problem solving.	**Career links:** The careers listed above all benefit from and utilise the programming skills that are continuing to be developed: • Software developer engineer, Data scientist, Cybersecurity analyst and game developer. **British Values:** • Democracy: Supports data-driven decision-making and

	Subject links: ▪ **Mathematics: using mathematical concepts can enrich problem solving skills- crucial for programming. Working with different number systems.**	**transparency in various sectors.** • **Individual Liberty: Empowers individuals with data analysis, planning and programming skills for personal and professional use.** • **Tolerance of Different Faiths and Beliefs: Encourages diverse perspectives in data interpretation and analysis.**
TERM 5 TOPIC/s	▪ ***Key Skills/Subject Links**	***Career links & BV**
• **Images** • **Sound** • **Compression** • **The internet and WANs** • **Local Area Networks** • **Programming fundamentals** • **Arrays** • **Procedures and functions**	**Key skills:** ▪ **Understanding how images/sounds are represented.** ▪ **Reading graphs.** ▪ **Planning and implementing algorithms/programs** ▪ **Debugging syntax and logic errors** ▪ **Critical thinking and analytical skills.** **Subject links:** ▪ **Mathematics: using mathematical concepts can enrich problem solving skills- crucial for programming and data representation.** ▪ **Music – a deeper understanding of how sound works.**	**Career links:** **The careers listed above all benefit from and utilise the programming skills that are continuing to be developed:** • **Software developer engineer, Data scientist, Cybersecurity analyst and game developer.** **Careers that can benefit from learning about data representation and networks include:** • **Technical support specialist** • **Computer technician** • **Network technician** • **Graphic designer** • **Photographer** • **Animator** **British values:** • **Democracy: Supports data-driven decision-making.** • **Individual Liberty: Empowers individuals with data analysis, planning and programming skills for personal and professional use.** • **In data representation, equality and respect for others means ensuring that data is represented**

		in a fair and unbiased manner, without manipulating to favour certain groups/agendas.
TERM 6 TOPIC/s	▪ ***Key Skills/Subject Links**	***Career links & BV**
• **Wireless Networking** • **Client Server and Peer to Peer networks** • **Standards Protocols and Layers** • **Procedures and functions** • **Records and files** • **Introduction to SQL**	**Key skills:** ▪ **Planning and implementing algorithms/programs** ▪ **Debugging syntax and logic errors** ▪ **Critical thinking and problem solving.** **Subject links:** ▪ **Mathematics: using mathematical concepts to program.** ▪ **DT: understanding of network hardware.**	**Career links:** • **Network administrator – managing and maintaining an organisation's network** • **Network security engineer** • **Python/programming careers as above.** **British Values:** • **Rule of Law: ensuring network and hardware practises comply with legislation.** • **Individual Liberty: respecting individual's freedom to use/access networks ensuring their privacy rights.**

KS4 Curriculum Overview: Computer Science

Year 2 GCSE/BTEC Option Subjects

TERM 1 TOPIC/s	*Key Skills/Subject Links	*Career links & BV
• Introduction to programming, embedded systems • Subprograms, the internet of things • Local and global variables, packet switching • Maths, time libraries, TCP/IP network layers • Problem solving, TCP/IP	**Key skills:** ▪ Planning and implementing algorithms/programs ▪ Creating subprograms ▪ Using libraries ▪ Debugging syntax and logic errors, ▪ Testing programs ▪ Critical thinking and problem solving. **Subject Links:** ▪ Mathematics: using mathematical concepts can enrich problem solving skills- crucial for programming.	**Career links:** Several careers make use of python programming including: • Software developer engineer: python is widely used in web development. • Data scientist: Python is a popular programming language for machine learning and data analysis. • Cybersecurity analyst: Python is used for tasks such as analysing security data and building security tools. • Game developer: Python can be used to create video games. British Values: • Democracy: Supports data-driven decision-making and transparency in various sectors. • Rule of Law: Emphasizes the importance of accurate and lawful data storage and management. • Individual Liberty: Empowers individuals with data analysis, planning and programming skills for personal and professional use. • Tolerance of Different Faiths and Beliefs: Encourages diverse perspectives in data interpretation and analysis.

TERM 2 TOPIC/s	*Key Skills/Subject Links	*Career links & BV
• Trace tables, environmental impact: manufacture and use • Errors, environmental impact: e-waste • Bubble sort, low level and high level languages • Binary search, translators • Problem solving, intellectual property	Key skills: ▪ Tracing variables ▪ Extended writing ▪ Performing sorting and searching algorithms. ▪ Planning and implementing algorithms/programs ▪ debugging syntax and logic errors ▪ Testing programs ▪ Critical thinking and problem solving. ▪ Forming a reasoned argument, extended writing skills. Subject Links: ▪ Mathematics: using mathematical concepts can enrich problem solving skills- crucial for programming ▪ Geography and Science: exploring the dangers to the environment and its potential implications. ▪ English- extended writing and forming a well-reasoned argument.	Career links: • Software developer engineer • Data scientist • Cybersecurity analyst. • Game developer • Intellectual property attorney British Values: • Democracy: Supports data-driven decision-making and transparency in various sectors. • Rule of Law: Emphasizes the importance of accurate and lawful data management and rightful legal ownership of intellectual property. • Individual Liberty: Empowers individuals with data analysis, planning and programming skills for personal and professional use.
TERM 3 TOPIC/s	***Key Skills/Subject Links**	***Career links & BV**
• Data types, string manipulation and validation, bitmap images • Data structures (one-dimensional), bitmap images • Trace tables, sound • Errors, sound • Problem solving, compression	Key skills: ▪ Planning and implementing algorithms/programs ▪ Manipulating strings ▪ Validating data ▪ Tracing variables	Career links: • Software developer engineer • Game developer • Web developer British Values:

	▪ Debugging syntax and logic errors ▪ Testing programs ▪ Critical thinking and problem solving. **Subject links:** ▪ Mathematics: using mathematical concepts can enrich problem solving skills- crucial for programming and data storage. ▪ ICT: exploring data types and validation- important considerations in ICT software projects. ▪ Music/physics: using concepts about how sound is formed to understand the factors that affect its quality.	• Democracy: Supports data-driven decision-making. • Individual Liberty: Empowers individuals with data analysis, planning and programming skills for personal and professional use.
TERM 4 TOPIC/s	▪ ***Key Skills/Subject Links**	***Career links & BV**
• Data structures (two-dimensional), AI, machine learning and robotics • Subprograms (local, global, procedures and functions), robotics • Problem solving, personal data • Trace tables, errors, privacy and ownership • Problem solving, testing with data, data protection legislation	**Key skills:** ▪ Planning and implementing algorithms/programs ▪ Debugging syntax and logic errors ▪ Testing programs ▪ Critical thinking and problem solving. ▪ Tracing variables in a program. ▪ Forming well-reasoned arguments. **Subject Links:**	**Career links:** ▪ Robotics technician: assisting in installing, maintaining and repeating robotic systems in various industries. ▪ Engineer (robotic/drone/deep learning/natural language processing) ▪ Programming careers (as above) ▪ Data scientist: analysing and interpreting complex data sets, developing machine learning models and providing

	▪ **Mathematics: using mathematical concepts can enrich problem solving skills- crucial for programming.** ▪ **English – extended writing and forming a reasoned argument.** ▪ **Citizenship: Understanding rights and responsibilities in data protection.** ▪ **Science: analysing complex data sets and forming subsequent conclusions/predictions.** ▪ **Psychology: considerations of the role of robotics in society and their impact on human behaviour.**	**subsequent insights used for making decisions.** **British values:** • **Democracy: Supports data-driven decision-making and transparency in robotics and their role in society.** • **Rule of Law: ensuring the developments stay within legal constraints.** • **Individual Liberty: Empowers individuals to work in robotics/machine learning, ensuring a focus on empowerment rather than infringement of an individual's liberties.** • **Tolerance of Different Faiths and Beliefs: Encourages diverse perspectives in the use of robotics in different cultures.**