Avonbourne Boys' & Girls' Academies
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United Sixth Form
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Subject Computer Science

Curriculum vision

Our Computer Science curriculum is structured in units and devises from the National curriculum. All learning outcomes can be explained through a high-level taxonomy of ten components, as shown below:

- **Algorithms** – identifying, designing, creating and assessing algorithms.
- **Computer networks** – comprehending how networks can be applied to retrieve and share data, along with the accompanying risks.
- **Computer Systems** – Recognising what is a computer and how its parts function together.
- **Creating media** – selecting and creating a wide range of media such as text, sound and video.
- **Data and information** – learning how data is accumulated, structured and applied, to represent real life products and scenarios.
- **Design and development** – understanding activities involved in planning, creating and evaluating computing products.
- **Effective use of tools –** using software to support learning.
- **Impact of technology** – understanding how we and society as a whole use and interact with computer systems.

<u>The Computing Curriculum is based around the following core principles:</u>

- **Inclusive and ambitious** – each lesson has been structured to support all pupils and builds on learning from previous lessons. Scaffolded activities are provided to ensure all students can reach the same objective. There are also extension activities to allow students to deepen their knowledge of the subject and challenge themselves.
- **Research informed** – As computing is a much newer subject, the curriculum has been built upon a set of pedagogical principles, reinforced by the latest computing research. The computing curriculum.
- **Supporting knowledge** – pupils will be supported with obtaining knowledge, through key concepts, terms and vocabulary including regular recall and revision.
- **Working together** – working within a team with peers is encouraged, using concepts such as pair programming, structured group tasks and peer instruction. This will increase classroom discussion and stimulate understanding of the units.
- **Real world examples** – Using real world examples along with a focus of mutuality with other curriculum subjects will aid students in their learning and cement their knowledge.
- **Hands on approach** – Our lessons make use of physical computing via project-based activities to solidify their knowledge and understanding.
- **Reading and exploring code** – Students will be encouraged to focus on reviewing and interpreting blocks if code, which will in turn support their ability to write code.
- **Challenging misconceptions** – throughout lessons formative questioning will be used to pinpoint any misconceptions and address them as they occur.

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Curriculum Overview

Term 1	Autumn 1	Why this? Why now?	Autumn 2	Why this? Why now?
Year 7	*Introduction to Computer Systems*	**Unit outcomes:** • Students will be able to navigate computer systems and use Teams for collaboration and organisation. • Students will be able to organise files and use email professionally. • Students will develop confidence in using cloud-based platforms for file management, improving their ability to access, save, and retrieve work efficiently.	*Online Safety*	**Unit outcomes:** • Students will understand key online safety terms and apply safety practices. • Students will recognise malware, phishing, and fake websites, and use security measures • Students will explain the Data Protection Act, Computer Misuse Act, and copyright laws
Year 8	*Computational Thinking*	**Unit outcomes:** • Students will understand and apply decomposition by breaking down complex problems into smaller, more manageable parts. • Students will develop abstraction skills by identifying key elements of a problem and filtering out unnecessary details. • Students will recognise patterns in data and processes to make problem-solving more efficient. • Students will apply computational thinking techniques to approach	*Data Representation*	**Unit outcomes:** • Students will understand the concept of the binary number system and its role in computer processing. • Students will be able to convert between binary and denary number systems confidently. • Students will explore how character sets such as ASCII and Unicode represent text in binary form.

		and solve real-world problems logically.		• Students will recognise how images are stored digitally using binary, including concepts such as pixels, resolution, and colour depth. • Students will apply their knowledge to encode and decode binary values for numbers, characters, and simple images
Year 9	*Binary Logic*	**Unit outcomes:** • Students will understand Boolean logic and how it is used in computing. • Students will identify and apply AND, OR, and NOT gates, predicting outputs based on inputs. • Students will construct and interpret trace tables, analysing logic circuits step by step. • Students will design and build their own logic circuits, applying logic gates to solve real-world computational problems. • Students will develop an understanding of how Boolean logic is used in computer hardware and programming.	*Networks and Protocols*	**Unit outcomes:** • Students will be able to distinguish between different types of networks (LAN and WAN), identify common network topologies, and evaluate their effectiveness. • Students will understand the role and purpose of common protocols in communication across networks and relate these to real-world examples. • Students will describe how data is transmitted over the internet using packets, including how packet switching works and the importance of IP addressing.

Year 10	*Systems Architecture*	**Unit outcomes:** • Understand the fundamental components of computer systems, including the central processing unit (CPU), memory, and input/output devices. • Describe the role and function of each component within a computer system architecture. • Explain the concept of the stored program concept and its significance in modern computing. • Analyse the differences between various data storage devices, including primary and secondary storage. • Evaluate the impact of different types of architecture, such as von Neumann and Harvard architectures, on system performance and functionality. • Demonstrate knowledge of binary representation and its application in data processing. • Understand the role of embedded systems and their applications in various technological contexts. • Apply computational thinking to solve problems related to systems architecture effectively.	*Memory and Storage*	**Unit outcomes:** • Explain the concept of computer memory and its role in data processing. • Differentiate between primary and secondary storage, providing examples of each. • Describe various types of memory, including RAM, ROM, and cache memory, and their specific functions within a computer system. • Evaluate the advantages and disadvantages of different storage media, such as hard disk drives (HDDs), solid-state drives (SSDs), and cloud storage solutions. • Analyse how data is represented in binary format and the implications for memory capacity and storage efficiency. • Assess the impact of capacity, speed, and cost when selecting appropriate storage solutions for various computing needs. • Discuss the importance of data backup and recovery methods in the context of data integrity and security.

Year 12	*Exchanging data*	**Unit overview** • Comprehend the significance of data representation in computing. • Investigate the principles of data transmission, including serial and parallel communication. • Analyse different data transmission protocols, such as TCP/IP and HTTP. • Evaluate the impact of bandwidth, latency, and error rates on data exchange processes. • Explore the significance of encryption and authentication in securing data transfer. • Develop practical skills in programming applications that implement data exchange techniques. • Examine real-world applications of data exchange across various domains, including networking and cloud computing.	*Software and software development*	**Unit overview:** • Understand the principles of software development life cycles, including analysis, design, implementation, testing, and maintenance. • Explore various programming paradigms, such as procedural, object-oriented, and functional programming. • Develop practical skills in coding, debugging, and testing software using an appropriate programming language. • Gain insights into the importance of documentation and version control in collaborative software projects. • Evaluate different software development methodologies, including Agile and Waterfall, and their application in real-world scenarios.

Term 2	Spring 1	Why this? Why now?	Spring 2	Why this? Why now?
Year 7	*Computer Hardware and Components*	**Unit outcomes:** • Students will define a computer and explain its basic function of input, processing, and output. • Students will identify different types of hardware and understand the difference between input and output devices • Students will identify the components inside a computer and explain their functions • Students will understand the role of the CPU and how its performance is influenced by factors such as speed and cache size. • Students will explain how the CPU, RAM, and secondary storage work together to process data and support computing tasks. • Students will understand how hardware components work together to create a functioning computer, either through a virtual or physical assembly process.	*Computer Hardware and Components*	**Unit outcomes:** • Students will define a computer and explain its basic function of input, processing, and output. • Students will identify different types of hardware and understand the difference between input and output devices • Students will identify the components inside a computer and explain their functions • Students will understand the role of the CPU and how its performance is influenced by factors such as speed and cache size. • Students will explain how the CPU, RAM, and secondary storage work together to process data and support computing tasks.

Year 8	*Text-based Python Game Project*	**Unit outcomes:** • Students will understand and apply the three fundamental programming constructs: sequence, selection, and iteration. • Students will develop a text-based interactive story using Python, incorporating user choices and logical flow. • Students will apply debugging techniques to identify and resolve errors in their programs. • Students will refine and test their programs using structured testing methodologies. • Students will gain confidence in writing and developing structured Python programs using an Integrated Development Environment (IDE).	*Text-based Python Game Project*	**Unit outcomes:** • Students will understand and apply the three fundamental programming constructs: sequence, selection, and iteration. • Students will develop a text-based interactive story using Python, incorporating user choices and logical flow. • Students will apply debugging techniques to identify and resolve errors in their programs. • Students will refine and test their programs using structured testing methodologies. • Students will gain confidence in writing and developing structured Python programs using an Integrated Development Environment (IDE).
Year 9	*Python Search and Sort Algorithms*	**Unit outcomes:** • Students will understand and define what an algorithm is, including its use in computer science and everyday tasks. • Students will explain the purpose of search and sort algorithms and compare the logic behind Linear and Binary Search. • Students will implement simplified Python versions of Bubble Sort, Merge Sort, and Insertion Sort.	*Python Search and Sort Algorithms*	**Unit outcomes:** • Students will understand and define what an algorithm is, including its use in computer science and everyday tasks. • Students will explain the purpose of search and sort algorithms and compare the logic behind Linear and Binary Search. • Students will implement simplified Python versions of Bubble Sort, Merge Sort, and Insertion Sort.

		• Students will apply logical thinking to trace how search and sort algorithms work, both unplugged and through code. • Students will evaluate which algorithm is most efficient or appropriate in different scenarios.		• Students will apply logical thinking to trace how search and sort algorithms work, both unplugged and through code. • Students will evaluate which algorithm is most efficient or appropriate in different scenarios.
Year 10	*Networks and Protocols*	**Unit outcomes:** • Understand the fundamental concepts of computer networks, including local area networks (LANs) and wide area networks (WANs). • Describe the purposes and functions of network topologies and the advantages and disadvantages of each type. • Explain the role of network protocols in facilitating communication between devices, including common protocols such as TCP/IP, HTTP, and FTP. • Identify and assess various network devices, including routers, switches, hubs, and modems, and their respective functions within a network. • Demonstrate knowledge of network security measures, including firewalls, encryption, and secure passwords.	*Network Security*	**Unit outcomes:** • Understand the fundamental concepts of network security and its importance in protecting data and systems. • Identify various types of network threats, including viruses, malware, and phishing attacks. • Explain the principles of encryption and its role in securing data during transmission. • Assess different security protocols, such as HTTPS, SSL, and VPNs, and their effectiveness in safeguarding network communications. • Describe the measures that can be implemented to secure a network, including firewalls, intrusion detection systems, and secure passwords.

		• Differentiate between client-server and peer-to-peer network models, outlining their characteristics and use cases. • Evaluate the impact of emerging technologies on networking, such as cloud computing and the Internet of Things (IoT).		• Evaluate case studies of network breaches to identify vulnerabilities and propose appropriate security solutions. • Apply practical skills to configure basic security settings on networking devices and software applications. • Develop an understanding of the ethical considerations surrounding network security and the responsibilities of network administrators.
Year 12	*Software and software development*	**Unit overview** • Understand the principles of software development life cycles, including analysis, design, implementation, testing, and maintenance. • Explore various programming paradigms, such as procedural, object-oriented, and functional programming. • Develop practical skills in coding, debugging, and testing software using an appropriate programming language. • Gain insights into the importance of documentation and version control in collaborative software projects.	*The characteristics of contemporary processors, input, output and storage devices*	**Unit overview** • Demonstrate an understanding of different software development methodologies, including Agile and Waterfall. • Apply techniques for requirements gathering and the creation of software specifications. • Utilise algorithmic thinking to develop efficient code solutions in a chosen programming language. • Explore the principles of software testing, including unit testing, integration testing, and user acceptance testing.

		• Evaluate different software development methodologies, including Agile and Waterfall, and their application in real-world scenarios.		• Recognise and implement best practices in version control and collaboration tools within software development environments. • Evaluate the impact of software on society and ethical considerations in software design and implementation.

Term 3	Summer 1	Why this? Why now?	Summer 2	Why this? Why now?
Year 7	*Block-based Programming*	**<u>Unit outcomes:</u>** • Students will program a sprite to move using key binds, iteration, and automatic movement. • Students will create and manage variables, understanding their role in storing and updating data. • Students will use arithmetic, logic, and comparative operators to process and produce Boolean values.	*Scratch to Python*	**<u>Unit outcomes:</u>** • Students will compare block-based and text-based programming, recognising key differences. • Students will define and use variables in Python, applying correct syntax for assignment and updating values. • Students will write basic Turtle commands to control movement and direction. • Students will understand and differentiate between fundamental data types.

Year 8	*Graphic Design*	**Unit outcomes:** • Students will develop the ability to identifying key objectives and requirements. • Students will understand the purpose of layers in digital design. • Students will use image editing tools to modify and enhance digital images. • Students will apply basic graphic design principles to create visually appealing compositions. • Students will gain familiarity with industry-standard graphic design software.	*HTML Web Development*	**Unit outcomes:** • Students will understand the structure and purpose of HTML as a markup language for web development. • Students will use basic HTML tags to create structured content, including headings, paragraphs, and lists. • Students will apply formatting tags to control the appearance of text elements on a webpage. • Students will incorporate images and hyperlinks into their webpages to improve functionality and navigation. • Students will develop confidence in writing and editing HTML code to create simple, functional webpages.
Year 9	*Impact of Digital Media and Technologies*	**Unit outcomes:** • Students will be introduced to the legal, ethical, moral, and environmental issues related to technology and media. • Students will explore how digital media influence's public opinion and behaviour. • Students will plan and create print media product to raise awareness of a key issue. • Students will evaluate media design for purpose and impact.	*Impact of Digital Media and Technologies*	**Unit outcomes:** • Students will be introduced to the legal, ethical, moral, and environmental issues related to technology and media. • Students will explore how digital media influence's public opinion and behaviour. • Students will plan and create print media product to raise awareness of a key issue.

		• Students will begin to understand the responsibilities of digital creators and the wider impact of their work.		• Students will evaluate media design for purpose and impact. • Students will begin to understand the responsibilities of digital creators and the wider impact of their work.
Year 10	*Systems Software*	**Unit overview:** • Demonstrate an understanding of the definition and functions of system software and its importance in managing computer hardware and software resources. • Identify various types of system software, including operating systems, utility programs, and firmware, along with their roles within a computer system. • Describe the process of booting a computer and the different stages involved in loading an operating system. • Explain the function and necessity of device drivers in facilitating communication between the operating system and hardware peripherals. • Understand file management techniques, including file systems, directories, and permissions, and their relevance to data organisation and security.	*Ethical Legal Cultural and Environmental Impacts*	**Unit overview:** • Demonstrate an understanding of the ethical implications of technology, including privacy, data security, and digital citizenship. • Evaluate the legal frameworks governing technology use, including copyright, data protection laws, and intellectual property rights. • Analyse the cultural effects of technology on society, addressing issues such as digital divide and social media influence. • Assess the environmental impact of computer systems and technology, focusing on sustainability and resource consumption. • Propose strategies to mitigate negative effects and promote ethical practices within the technology sector.

		• Evaluate the impact of system software on overall system performance and user experience, including considerations of efficiency and optimisation. • Analyse the significance of software updates and patches in maintaining system security and functionality.		• Investigate case studies that illustrate ethical dilemmas and legal challenges in the realm of computing. • Engage in discussions about the role of technology in shaping societal values and cultural norms. • Develop critical thinking and problem-solving skills through evaluations of real-world scenarios related to ethical, legal, and environmental considerations in computer science.
Year 12	*Data types, data structures and algorithms*	**<u>Unit overview</u>** • Understand the various data types, including primitive and composite types, and their respective applications. • Explore data structures such as arrays, linked lists, stacks, and queues, evaluating their strengths and weaknesses. • Investigate the principles of algorithm design, including the importance of efficiency and the need for optimisation. • Apply appropriate data structures in problem-solving scenarios, demonstrating an understanding of their practical applications.	*Legal, moral, cultural and ethical issues*	**<u>Unit overview</u>** • Develop an understanding of relevant laws affecting computer science, including data protection, intellectual property, and cybercrime. • Examine ethical dilemmas encountered in the field, such as privacy concerns, surveillance, and artificial intelligence. • Analyse cultural impacts of technology, including its role in shaping social interactions and global communication. • Evaluate the moral responsibilities of computer

		• Evaluate common algorithms, including search and sort techniques, and compare their performance across different contexts. • Develop the ability to rigorously analyse the time and space complexity of algorithms using Big O notation.		scientists and the implications of their decisions on society. • Foster discussions on the importance of responsible computing and the role of technology in addressing global challenges.