

Key Stage 4 Subject Timeline

Subject: Computer Science

Exam Board: OCR

Year 9						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topics	Developing Python skills (intro presentations on variables onwards...)	Problem decomposition and flowchart algorithms.	Systems Architecture	Memory and storage	Wired and wireless networks	Network topologies, protocols and layers
Key skills and Concepts	<p>Develop analytic, problem-solving, design, and computational thinking skills.</p> <p>Python skills to include:</p> <ul style="list-style-type: none"> - Variables - User input - Lists and arrays 	<p>Computational thinking through problem decomposition.</p> <p>The importance of algorithms in Computer Science.</p> <p>Presentation of flowchart algorithms using standardised symbols.</p> <p>Conversion of flowchart algorithms to Python programs.</p>	<p>The purpose of the CPU:</p> <ul style="list-style-type: none"> - Von Neumann architecture: - MAR (Memory Address Register) - MDR (Memory Data Register) - Program Counter - Accumulator <p>Common CPU components and their function:</p> <ul style="list-style-type: none"> - ALU (Arithmetic Logic Unit) - CU (Control Unit) - Cache <p>How common characteristics of CPUs affect their performance:</p> <ul style="list-style-type: none"> - Clock speed - Cache size - Number of cores <p>Embedded systems:</p> <ul style="list-style-type: none"> - Purpose of embedded systems - Examples of embedded systems 	<p>Memory:</p> <ul style="list-style-type: none"> - The difference between RAM and ROM - The purpose of ROM in a computer system - The purpose of RAM in a computer system - The need for virtual memory - flash memory. <p>Storage:</p> <ul style="list-style-type: none"> - The need for secondary storage - Data capacity and calculation of data capacity requirements - Common types of storage (optical, magnetic, solid state) - Suitable storage devices and storage media for a given application, and the advantages and disadvantages of these, using characteristics (capacity, speed, portability, durability, reliability, cost). 	<p>Types of networks:</p> <ul style="list-style-type: none"> - LAN - WAN <p>Factors that affect the performance of networks.</p> <p>The different roles of computers in a client-server and a peer-to-peer network</p> <p>The hardware needed to connect stand-alone computers into a Local Area Network (wireless access points, routers/switches, NIC)</p> <p>Transmission media</p> <p>The internet as a worldwide collection of computer networks (DNS, hosting, the cloud)</p> <p>The concept of virtual networks.</p>	<p>Star and mesh network topologies</p> <p>Wi-Fi:</p> <ul style="list-style-type: none"> - frequency and channels - encryption <p>Ethernet</p> <p>The uses of IP addressing, MAC addressing, and protocols including:</p> <ul style="list-style-type: none"> - TCP/IP - HTTP - HTTPS - FTP - POP - IMAP - SMTP <p>The concept of layers</p> <p>Packet switching.</p>
Threshold Concepts	From KS3 students should be aware of how to use the IDLE interpreter and to create basic programs involving inputs and outputs.	Simple Computer Science flowcharts with inputs, processes and outputs as covered in the KS3 unit on Flowgrid.	From KS3, pupils need to be aware of the role of a CPU within a computer system.	From KS3, pupils need to be aware of the role why computers need memory and storage.	Students will apply the understanding they have of local area networks through use of the school network and (in most cases) home networks.	This unit builds directly on the previous unit on wired and wireless networks.

Key Stage 4 Subject Timeline

Subject: Computer Science

Exam Board: OCR

		Students will need to apply foundation skills of Python programming covered in the first half term.				
Endpoints	Students to have developed their ability to use the foundations of Python programming to create simple programs to meet requirements.	Students able to read, work through, edit and create algorithms in the form of flowcharts. Students able to decompose a problem and represent it as a flowchart. Students create Python programs based on algorithm flowcharts.	Students to have produced notes and demonstrated their awareness of all systems architecture concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.	Students to have produced notes and demonstrated their awareness of all memory and storage concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.	Students to have produced notes and demonstrated their awareness of all wired and wireless networks concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.	Students to have produced notes and demonstrated their awareness of all network topologies, protocols and layers concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.
Assessment	Students will be assessed through a programming challenge.	Exam-style questions on flowchart algorithms.	End of unit tests – on screen and written (using relevant past-exam questions).	End of unit tests – on screen and written (using relevant past-exam questions).	End of unit tests – on screen and written (using relevant past-exam questions).	End of unit tests – on screen and written (using relevant past-exam questions).
Cultural Capital	Coding club available after school to extend and enrich opportunities to develop coding skills. This will focus on skills and programming languages which are outside the confinements of the specification.	Bebras Challenge... “The Bebras® Computing Challenge introduces computational thinking to students. It is organized in over 30 countries and designed to get students all over the world excited about computing”.	Coding club available after school to extend and enrich opportunities to develop coding skills. This will focus on skills and programming languages which are outside the confinements of the specification.		After school club to attempt the ‘Cyber Security Challenge UK’. This fun activity provides students with the chance to learn about key roles in the cyber security industry, and how to reduce cyber security risks.	

Key Stage 4 Subject Timeline

Subject: Computer Science

Exam Board: OCR

Year 10						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topics	Network Security	Systems Software	Ethical, legal, cultural and environmental concerns	Computational thinking and algorithms	Producing robust programs	Computational logic
Key skills and Concepts	<p>Forms of attack</p> <p>Threats posed to networks:</p> <ul style="list-style-type: none"> - Malware - Phishing - Social engineering - Brute force attacks - Denial of service attacks - Data interception and theft - SQL injection - Poor network policy <p>Identifying and reducing vulnerabilities:</p> <ul style="list-style-type: none"> - Penetration testing - Network forensics - Network policies - Anti-malware software - Firewalls - User access levels - Passwords - Encryption. 	<p>The purpose and functionality of systems software</p> <p>Operating systems:</p> <ul style="list-style-type: none"> - User interface - Memory management/multitasking - Peripheral management and drivers - User management - File management <p>Utility system software:</p> <ul style="list-style-type: none"> - Encryption software - Defragmentation - Data compression <p>The role and methods of backup:</p> <ul style="list-style-type: none"> - Full - Incremental 	<p>How to investigate and discuss Computer Science technologies while considering:</p> <ul style="list-style-type: none"> - ethical issues - legal issues - cultural issues - environmental issues. - privacy issues. <p>How key stakeholders are affected by technologies</p> <p>Open source vs proprietary software</p> <p>Legislation relevant to Computer Science:</p> <ul style="list-style-type: none"> - The Data Protection Act 1998 - Computer Misuse Act 1990 - Copyright Designs and Patents Act 1988 - Creative Commons Licensing - Freedom of Information Act 2000. 	<p>Computational thinking:</p> <ul style="list-style-type: none"> - abstraction - decomposition - algorithmic thinking <p>Standard searching algorithms:</p> <ul style="list-style-type: none"> - binary search - linear search <p>Standard sorting algorithms:</p> <ul style="list-style-type: none"> - bubble sort - merge sort - insertion sort <p>How to produce algorithms using:</p> <ul style="list-style-type: none"> - pseudocode - using flow diagrams <p>Interpret, correct or complete algorithms.</p>	<p>Defensive design considerations:</p> <ul style="list-style-type: none"> - input sanitisation/validation - planning for contingencies - anticipating misuse - authentication <p>Maintainability:</p> <ul style="list-style-type: none"> - comments - indentation <p>Types of testing:</p> <ul style="list-style-type: none"> - iterative - final/terminal <p>How to identify syntax and logic errors</p> <p>Selecting and using suitable test data.</p>	<p>Why data is represented in computer systems in binary form</p> <p>Simple logic diagrams using the operations AND, OR and NOT</p> <p>Truth tables</p> <p>Combining Boolean operators using AND, OR and NOT to two levels</p> <p>Applying logical operators in appropriate truth tables to solve problems</p> <p>Applying computing-related mathematics:</p> <ul style="list-style-type: none"> - + - - - / - * - Exponentiation (^) - MOD - DIV

Key Stage 4 Subject Timeline

Subject: Computer Science

Exam Board: OCR

Threshold Concepts	This unit will build on existing general knowledge about online risks in their personal use of digital technology and online safety issues covered in KS3.	This unit will draw upon student knowledge of operating systems on PCs and mobile devices.	This unit will draw upon student knowledge of the school's technology agreement which all should already be aware of.	This unit will build upon the introduction to problem decomposition covered in the second half term of Year 9.	Students should by now have plenty of experience of developing programs in Python and the challenges that can arise for the programmer and the end user.	Students should have a basic understanding of the importance of binary in Computing from KS3 and should have practical experience of using Mathematical operators in Python.
Endpoints	Students to have produced notes and demonstrated their awareness of all network security concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.	Students to have produced notes and demonstrated their awareness of all systems software concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.	Students to have produced notes and demonstrated their awareness of all CS concern concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.	Students to have produced notes and demonstrated their awareness of all systems architecture concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.	Students to have produced notes and demonstrated their awareness of all systems architecture concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.	Students to have produced notes and demonstrated their awareness of all systems architecture concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.
Assessment	End of unit tests – on screen and written (using relevant past-exam questions).	End of unit tests – on screen and written (using relevant past-exam questions).	End of unit tests – on screen and written (using relevant past-exam questions).	End of unit tests – on screen and written (using relevant past-exam questions).	End of unit tests – on screen and written (using relevant past-exam questions).	End of unit tests – on screen and written (using relevant past-exam questions).
Cultural Capital	Coding club available after school to extend and enrich opportunities to develop coding skills. This will focus on skills and programming languages which are outside the confinements of the specification.	Bebras Challenge... "The Bebras® Computing Challenge introduces computational thinking to students. It is organized in over 30 countries and designed to get students all over the world excited about computing".	Coding club available after school to extend and enrich opportunities to develop coding skills. This will focus on skills and programming languages which are outside the confinements of the specification.		After school club to attempt the 'Cyber Security Challenge UK'. This fun activity provides students with the chance to learn about key roles in the cyber security industry, and how to reduce cyber security risks.	

Key Stage 4 Subject Timeline

Subject: Computer Science

Exam Board: OCR

Year 11						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topics	Preparation for and undertaking of NEA	Continuation and completion of NEA	Data representation	Revision	Revision	
Key skills and Concepts	<p>Identification of success criteria and testing procedures.</p> <p>The use of variables, constants, operators, inputs, outputs and assignments</p> <p>The use of the three basic programming constructs (sequence, selection, iteration)</p> <p>The use of basic string manipulation</p> <p>The use of basic file handling operations</p> <p>The use of arrays (or equivalent) when solving problems, including both one and two dimensional arrays</p> <p>How to use sub programs (functions and procedures) to produce structured code</p> <p>The use of data types (integer, real, Boolean, character and string)</p> <p>The common arithmetic and Boolean operators</p>	<p>The use of variables, constants, operators, inputs, outputs and assignments</p> <p>The use of the three basic programming constructs (sequence, selection, iteration)</p> <p>The use of basic string manipulation</p> <p>The use of basic file handling operations</p> <p>The use of arrays (or equivalent) when solving problems, including both one and two dimensional arrays</p> <p>How to use sub programs (functions and procedures) to produce structured code</p> <p>The use of data types (integer, real, Boolean, character and string)</p> <p>The common arithmetic and Boolean operators</p> <p>Application of testing procedures.</p> <p>Effective project evaluation.</p>	<p>Characters</p> <ul style="list-style-type: none"> • the use of binary codes to represent characters • the term 'character-set' • ASCII, extended ASCII and Unicode. <p>Images</p> <ul style="list-style-type: none"> • how an image is represented as a series of pixels represented in binary • metadata included in the file • the effect of colour depth and resolution on the size of an image file. <p>Sound</p> <ul style="list-style-type: none"> • how sound can be sampled and stored in digital form • sample size • bit rate • sampling frequency. <p>Compression</p> <ul style="list-style-type: none"> • need for compression • Lossy vs lossless compression 	<p>Focus to be determined by analysis of individual and whole-group performance in PPEs.</p>	<p>Focus to be determined by analysis of individual and whole-group performance in PPEs.</p>	

Key Stage 4 Subject Timeline

Subject: Computer Science

Exam Board: OCR

Threshold Concepts	Students should at this stage have experience of having undertaken all practical elements they might need to perform in the NEA. Students will need to draw upon previous work completing in the unit 'producing robust programs'.	Students should at this stage have experience of having undertaken all practical elements they might need to perform in the NEA. Students will need to draw upon previous work completing in the unit 'producing robust programs'.		Students should be familiar with all components of the specification.	Students should be familiar with all components of the specification.	
Endpoints	Students to have completed the analysis and design stages of the NEA. They should also have created initial prototypes of sections (or all) of the program.	Students must have fully completed the NEA, including testing and evaluation of the final product.	Students to have produced notes and demonstrated their awareness of all data representation concepts listed above. End of unit summary completed with glossary and key concepts traffic-lighting completed.	Students fully prepared to meet / exceed challenging targets.	Students fully prepared to meet / exceed challenging targets.	
Assessment	NEA progress assessed against mark scheme set by exam board.	Pre-public exam. Final NEA project assessed against mark scheme set by exam board.	End of unit tests – on screen and written (using relevant past-exam questions).	Students fully prepared to meet / exceed challenging targets.	Students fully prepared to meet / exceed challenging targets.	
Cultural Capital	'Lawnchair Larry Challenge' – an extra-curricular STEM challenge involving a practical challenge with opportunities for robotics, 3D printing, coding, etc.	Continuation of 'Lawnchair Larry Challenge'. Also the Bebras Challenge.	Coding club available after school to extend and enrich opportunities to develop coding skills. This will focus on skills and programming languages which are outside the confinements of the specification.	Extra-curricular revision sessions planned and delivered aimed at different ability levels.	Extra-curricular revision sessions planned and delivered aimed at different ability levels.	