COMPUTER SCIENCE CURRICULUM INTENT: *Exam Board - OCR*

Computer science has deep links with mathematics, science and design and technology, and provides insights into both natural and artificial systems.
in which pupils are taught the principles of information and computation, how digital systems work and how to put this knowledge to use through programming. Computer science also ensures that pupils become digitally literate e.g., be able to use, and express themselves and develop their ideas through, information and communication technology.

Computer Science is an intensely creative subject that combines invention and excitement and can look at the natural world through a digital prism. It is a practical subject where learners can apply the academic principles learned in the classroom to real world systems. OCR computer Science will value computational thinking, helping learners to develop the skills to solve problems, design systems and understand the power and limits of human and machine intelligence (AI).

Pupils will gain an understanding of and ability to apply the fundamental principles and concepts of computer science including abstraction, decomposition, logic, algorithms, and data representation. They will also gain the ability to analyse problems in computational terms through practical experience of problem-solving e.g. write and debug programs.

During the curriculum, pupils will have the ability for thinking creatively, innovatively, analytically, logically, and critically. But also, to have the ability to see the relationships between different aspects of computer science, mathematical skills, and the ability to understand the individual (moral), social (ethical), legal and cultural opportunities and risks of digital technology in the real world.

CURRICULUM IMPLEMENTATION: COMPUTER SCIENCE

	AUTUMN TERM		SPRING TERM		SUMMER TERM		
	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**	
Year 7 **Knowledge:** *What will students know?*	**Using Computer Safely, effectively, and Responsibly** This is a theoretical unit covering the necessary basic knowledge to use computers safely, effectively, and responsibly. Pupils begin by looking at file management and security. The unit then moves on to e-safety (cyberbullying, phishing etc.), and online profiles to give pupils a better understanding and awareness of using social media. The functionality and operation of email and search engines and how to use them effectively are covered, and a final lesson includes a multiple-choice test on the contents of the unit and basic computer use.	**Programming in Small Basics** In this unit pupils will be introduced to the Small Basics programming environment and begin by looking and altering some existing games. They will then progress to planning and developing their own games, learning to incorporate variables, procedures (using the Broadcast function), lists and operators. They should be able to create a fully working game with lives, scoring and some randomisation of objects. Finally, they will learn to test and debug their programs.	**Games Programming in Scratch** In this unit pupils will be introduced to the Scratch programming environment. They will then progress to planning and developing their own games, learning to incorporate variables, procedures (using the Broadcast function), lists and operators. They should be able to create a fully working game with lives, scoring and some randomisation of objects.	**Understanding Computers** The unit is a theoretical unit covering the basic principles of computer architecture and use of binary. Pupils will revise some of the theory on input and output (look at the Input-Process-Output sequence and the Fetch-Decode-Execute) cycle through practical activities. Pupils will then look at some simple binary to decimal conversion. Pupils will learn more in depth how storage devices represent data using binary patterns and physically save these patterns. Finally, they will look at a brief history of communication devices, how new technologies and applications are emerging.	**Networks** This is a theoretical unit covering the basic principles and architecture of local and wide area networks. Pupils will learn that the World Wide Web is part of the Internet, and how web addresses are constructed and stored as IP addresses. Client-server, peer-to peer networks and the concept of cloud computing are all described. Ways of keeping data secure and simple encryption techniques are also covered.		**Year 7**

Year 7 Skills: *What skills will students have developed?*	To think before sharing and or posting. To be able to judge the possible impact of their online activity on others. How to change their password as well as how to create a secure password which then will use howsecureismypassword.com to test strength of their password(s). Finally, how to send/receive and delete emails. SMSC: Spiritual - Students look at how technology can bring rapid benefits to discussions and acceptance to an individual's beliefs. However, students are also exposed to the limitations and abuse of the internet where they question and justify the aims, values, and principles of their own and others' beliefs.	Students will be able to write and draw simple algorithms to create programs to draw shapes. SMSC: Cultural - Appreciating how different cultures have contributed to technology. How development in technology has impacted different cultures and backgrounds in different ways. More developed countries can keep pace with the developments in technology whilst less developed ones can't. Students learn about how this can impact on the people in the country and form larger skills gaps.	Students will be able to write and draw simple algorithms to create programs to draw shapes. Use two or more programming languages, to solve a variety of computational problems. Make appropriate use of data structures such as lists, tables, or arrays. To design and develop modular programs that use procedures or functions. Understand simple Boolean logic (such as AND, OR and NOT). SMSC: Cultural - Appreciating how different cultures have contributed to technology. Students learn about how more and less developed countries can impact on the people in the country and form larger skills gaps.	Name hardware and software components that make up computer systems and explain how they communicate with one another and with other systems. Understand how instructions are stored and executed within a computer system. Explain how data of various types (including text, sounds, and pictures) can be represented and manipulated digitally. SMSC: Spiritual - Computer science provides opportunities for reflection and wonder about the achievements in today's modern world/technologies and the possibilities for the future. This enables students to reflect on how computers (AI) can sometimes perform better in certain activities than people.	Students will be able to identify common hardware components and uses of common software applications. Students will be able to work in groups to present future technology ideas using reliable sources of information from the WWW. SMSC: Social - Students will need to work with a variety of people when they go into the world of work and these exercises will develop their social skills. Also, students are required to understand about social media and the advantages these sites have brought as well as the numerous problems such as cyber bullying. Students also learn about the social isolation that technology has brought to some jobs as workers find themselves sat at computers and not necessarily working face to face with other people.	**Year 7**

Year 8 Knowledge: *What will students know?*	**Computer Crime and Cyber Security** This unit covers some of the legal safeguards regarding computer use, including overviews of the Computer Misuse Act, Data Protection Act and Copyright Law and their implications for computer use. Phishing scams and other email frauds, hacking, "data harvesting" and identity theft are discussed together with ways of protecting online identity and privacy. Health and Safety Law and environmental issues such as the safe disposal of old computers are also discussed.	**Modelling in Small Basics** Students will know what makes an effective game for one and two players	**Introduction to Coding via Kodu** This unit is an introduction to the fundamentals of computer programming and games design via Kodu, developed by Microsoft Games Lab. Pupils will be introduced to the idea of computer programs requiring a specific series of coding statements and, through using Kodu, will understand how to build a world and program characters and objects before moving on to enhance their games with more advanced features.	**Fundamentals of a computer system** Students will investigate "How Computers Work", looking at the hardware and software that comprise computers.	**Introduction to Python programming language** It is an introduction to Python, a well-known programming language used in the real world but easy-to-use high-level programming language. The focus is on getting pupils to understand the process of developing programs, the importance of writing correct syntax, being able to formulate algorithms for simple programs and debugging their programs.	**Python (continued)** It is an introduction to Python, a well-known programming language used in the real world but easy-to-use high-level programming language. The focus is on getting pupils to understand the process of developing programs, the importance of writing correct syntax, being able to formulate algorithms for simple programs and debugging their programs.	**Year 8**

Year 8 Skills: *What skills will students have developed?*	Students will be able to recognise cyber-bullying and what to do about it. Name the major Acts concerning computer use. Briefly describe some of the dangers of putting personal data on social networking sites. Follow the Copyright Law when using written text, downloading music etc. List some of the Health and Safety hazards associated with computer use. Describe how to safely dispose of an old computer. **SMSC – Social & Moral.** Students will need to work with a variety of people when they go into the world of work and these exercises will develop their social skills. Students consider the effects of social networking and the consequences of cyber bullying; they also consider the legal aspects including the Data Protection Act, Computer Misuse Act and Copyright legislation.	Students will be able to understand and write the basics of programming conditionals. This will teach students logical thinking skills. **SMSC – Moral.** Computing helps students to explore aspects of real and imaginary situations and enables them to reflect on the possible consequences of different actions and situations. It can raise issues such as whether it is morally right to have computer games whose aim is killing and violence.	Students will be able to explain that a computer program requires a precise series of instructions to operate. Create and change basic landscape features in Kodu. Create a range of game techniques such as pathing, clones and creatables in their game. **SMSC – Moral.** Computing helps students to explore aspects of real and imaginary situations and enables them to reflect on the possible consequences of different actions and situations. It can raise issues such as whether it is morally right to have computer games whose aim is killing and violence.	Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems. Understand how instructions are stored and executed within a computer system. Draw a block diagram showing CPU, input, output, and storage devices. Name different types of permanent storage device. **SMSC – Cultural.** Students are asked to reflect on how different cultures are represented on the internet and why or who is representing them in this way. Students are also challenged to think about how differing cultures access and use the internet and what implications this has on the individual and the culture.	Students will be able to adapt and write Python code to create simple working input and output statements. Problem solving skills. Students will use the concept of the debugging to write and fix errors in their code. Students will learn about the techniques of sequence, selection, and iteration. **SMSC** – **Empathy.** When designing programs, students learn about accessibility, in particular the requirements of users with special needs.	**Year 8**

Year 9 Knowledge: *What will students know?*	**Theory:** Unit 1: Systems architecture, memory, and storage. **Practical:** Practical Programming Skills in Python. This unit covers the CPU (functions and characteristics), Von Neumann architecture, embedded systems. Primary memory, secondary storage, units of measurements. This unit will also cover the components of a computer system. Describing the role of the CPU and all its components and registers. Explaining the effect of the Fetch-Decode-Execute Cycle on registers. Students will be able to write selection, iteration, and function statements on Python programming language.	**Theory:** Unit 3: Wired and Wireless Networks. **Practical:** Practical Programming Skills in Python (continued) This is a theoretical unit covering the basic principles and architecture of local and wide area networks. Pupils will learn that the World Wide Web is part of the Internet, and how web addresses are constructed and stored as IP addresses. Client-server, peer-to peer networks and the concept of cloud computing are all described. Ways of keeping data secure and simple encryption techniques are also covered. Students will be able to read, write and append files on Python.	**Theory:** Unit 4: Network Security and System Software. **Practical:** Practical Programming Skills in Python (continued) This unit covers system software's, the different operating systems (OS) and utility software's found in a computer system being able to Identify vulnerabilities. Students will be able to understand and write regular expressions on Python.	**Theory:** Unit 5 – Ethical, Legal, Cultural, and Environmental Concerns. **Practical:** Practical Programming Skills in Python (continued) This unit will cover the ethical, legal, cultural, and environmental concerns of computer systems in the modern world, ethical, cultural, and environmental issues, legislation, and privacy issues related to technology in the real world such as AI. Understanding the ethics of AI are covered with students being able to consider several different areas of ethical concern. Students will be able to sort different lists on python from smallest to largest and vice versa.	**Theory:** Unit 6: Algorithms. **Practical:** Practical Programming Skills in Python (continued) Students will analyse and design algorithms for a given situation. They will compare algorithms and identify the problems in each program. Produce solutions in Python to perform searching and sorting algorithms.	**Year 9**

Year 9 Skills: *What skills will students have developed?*	Students will understand Von Neumann architecture as well as identifying components of a CPU. Students should explain the fetch-decode-execute cycle and the different embedded systems found in the real world. Students will understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems. **SMSC – Cultural.** Whilst studying various aspects of computing students are asked to reflect on how different cultures are portrayed on the internet and why or who is portraying them in this way. Students are also challenged to think about how different cultures access and use the internet and what consequences this has on the individual and the culture.	Students will be able to draw and identify star and mesh network topologies as well as identify different types of viruses and how they can protect themselves from viruses. Students will also understand how instructions are stored and executed within a computer system; understanding how different data types (including text, sounds, and pictures) can be represented in a computer.	Students will be able to describe the purpose and function of an OS as well the different functions of common utility programs. **SMSC – Moral.** Students will understand why keeping private information safe about its customers and staff and if students agree with digital surveillance by e.g., governments and if the work of hacking to expose confidential data/information is right or wrong.	Students to explain how different stakeholders are impacted by technology. Compare open source and proprietary software. Understand e-waste. Understand laws and legal issues. **SMSC: Cultural -** Identifying how a student would identify their "digital self" and how many young people are able to find a sense of belonging within the online world (social media) that they may struggle elsewhere. Appreciating how different cultures have contributed to technology. More developed countries can keep pace with the developments in technology whilst less developed ones can't. Students learn about how this can impact on the people in the country and form larger skills gaps.	Students will learn about the techniques of sequence, selection, and iteration. **SMSC: Social -** Problem solving through problems.	**Year 9**

	<u>Subject Specific Skills: AO1, AO2</u> **(Component 1)** **1.1 Systems Architecture:** 1.1.1 Architecture of the CPU 1.1.2 CPU performance 1.1.3 Embedded systems **1.2 Memory and storage:** 1.2.1 Primary storage (Memory) 1.2.2 Secondary storage 1.2.3 Units 1.2.4 Data storage 1.2.5 Compression **1.3 Computers networks, connections, and protocols** 1.3.1 Networks and topologies 1.3.2 Wired and wireless networks, protocols, and layers **1.4 Network security** 1.4.1 Threats to computer systems and networks 1.4.2 Identifying and preventing vulnerabilities **1.5 Systems software** 1.5.1 Operating systems 1.5.2 Utility software **1.6 Ethical, legal, cultural, and environmental impacts of digital technology** 1.6.1 Ethical, legal, cultural, and environmental impact **(Component 2)** **2.1 Algorithms** 2.1.1 Computational thinking 2.1.2 Designing, creating and refining algorithms. 2.1.3 Searching and sorting algorithms.	

Year 10 Knowledge: *What will students know?*	**Theory:** Unit 2- Data Representation **Practical:** Unit 7: Programming This unit will identify the difference between the data types. Converting binary and hexadecimal to decimal and vice versa. Students will understand more about the units of measurements used in computing, e.g., bit, nibble, bytes, Kilobyte. Students will be able to write sequence, selection and iteration statements as well write different arrays within their code.	**Theory:** Unit 2- Data Representation (continued) **Practical:** Unit 7: Programming (continued) This unit will identify the difference between the data types. Converting binary and hexadecimal to decimal and vice versa. Students will understand more about the units of measurements used in computing, e.g., bit, nibble, bytes, Kilobyte. Students will be able to write sequence, selection and iteration statements as well write different arrays within their code.	**Theory:** Unit 8: Logic and Languages **Practical:** NAE Project Students will be able to draw logic diagrams and truth tables, defensive design, errors and testing, facilities of an ID. Students will also be able to test code identify syntax and logic errors.	**Theory:** Unit 6: Algorithms **Practical:** NAE Project In this unit, students will learn about the theory of algorithms such as searching and sorting algorithms (bubble sort, insertion sort, merge sort, quick sort). Students will also analyse and design algorithms for a given situation. They will compare algorithms and identify the problems in each program. Produce solutions in Python to perform searching and sorting algorithms.	**Theory:** Unit 6: Algorithms **Practical:** NAE Project In this unit, students will learn about the theory of algorithms such as searching and sorting algorithms (bubble sort, insertion sort, merge sort, quick sort). Students will also analyse and design algorithms for a given situation. They will compare algorithms and identify the problems in each program. Produce solutions in Python to perform searching and sorting algorithms.	**Year 10**

Year 10 Skills: *What skills will students have developed?*	Students will be able to list units of measurements in order. Students will be able to convert different units of measures from binary, denary and hexadecimal values.	Students will be able to list units of measurements in order. Students will be able to convert different units of measures from binary, denary and hexadecimal values.	Students will be able to draw and complete simple logic diagrams. Draw and complete truth tables. Describe defensive design considerations. Use comments and indentation to assist maintainability.	Students will learn about the techniques of sequence, selection, and iteration. Students will undertake a series of self-directed programming practice including practical programming challenges to prepare for programming project. **SMSC: Cultural -** Problem solving through problems. Computational thinking encourages students to develop and explore their problem-solving skills. Computing encourages students to apply their computing skills and to gain knowledge of how programming links between subjects for instance maths.	Students will learn about the techniques of sequence, selection, and iteration. Students will undertake a series of self-directed programming practice including practical programming challenges to prepare for programming project. **SMSC: Cultural -** Problem solving through problems. Computational thinking encourages students to develop and explore their problem-solving skills. Computing encourages students to apply their computing skills and to gain knowledge of how programming links between subjects for instance maths.	**Year 10**
	<u>Subject Specific Skills: AO2, AO3</u> **(Component 2)** **2.1 Algorithms** 2.1.1 Computational thinking 2.1.2 Designing, creating and refining algorithms. 2.1.3 Searching and sorting algorithms. **2.2 Programming fundamentals** 2.2.1 Programming fundamentals 2.2.2 Data types 2.2.3 Additional programming techniques **2.3 Producing robust programs.** 2.3.1 Defensive design 2.3.2 Testing **2.4 Boolean logic** 2.4.1 Boolean logic					

	2.5 Programming languages and Integrated Development Environments 2.5.1 Languages 2.5.2 The Integrated Development Environment (IDE)				
Year 11 Knowledge: *What will students know?*	**Theory:** Unit 6: Algorithms **Practical:** Practical Programming Skills in Python In this unit, students will learn about the theory of algorithms such as searching and sorting algorithms (bubble sort, insertion sort, merge sort, quick sort). Students will also analyse and design algorithms for a given situation. They will compare algorithms and identify the problems in each program. Produce solutions in Python to perform searching and sorting algorithms.	**Theory:** Unit 8: Logic and Languages **Practical:** NAE Project Students will be able to draw logic diagrams and truth tables, defensive design, errors and testing, facilities of an ID. Students will also be able to test code identify syntax and logic errors.	**Theory:** Unit 2- Data Representation **Practical:** NAE Project This unit will identify the difference between the data types. Converting binary and hexadecimal to decimal and vice versa. Students will understand more about the units of measurements used in computing, e.g., bit, nibble, bytes, Kilobyte.	**Theory:** Exam revision **Practical:** NAE Project Revision for all units on the GCSE OCR curriculum. Students will undertake a series of self-directed programming practice including practical programming challenges to prepare for programming project.	**Year 11**

Year 11 Skills: *What skills will students have developed?*	The skills learnt throughout the unit will not only help students understand the theory of the entire qualification, but also enable them to analyse the problems and plan solutions for their individual Programming Project. **SMSC: Cultural -** Problem solving through problems. Computational thinking encourages students to develop and explore their problem-solving skills. Computing encourages students to apply their computing skills and to gain knowledge of how programming links between subjects for instance maths.	Students will be able to draw and complete simple logic diagrams. Draw and complete truth tables. Describe defensive design considerations. Use comments and indentation to assist maintainability.	Students will be able to list units of measurements in order. Students will be able to convert different units of measures from binary, denary and hexadecimal values.	Students will be able to write sequence, selection and iteration statements as well write different arrays within their code. Confidently answer exam style questions.	**Year 11**
	<u>Subject Specific Skills: AO1, AO2, AO3</u> **(Component 1)** **1.7 Systems Architecture:** 1.7.1 Architecture of the CPU 1.7.2 CPU performance 1.7.3 Embedded systems **1.8 Memory and storage:** 1.8.1 Primary storage (Memory) 1.8.2 Secondary storage 1.8.3 Units				

	1.8.4 Data storage 1.8.5 Compression **1.9 Computers networks, connections, and protocols** 1.9.1 Networks and topologies 1.9.2 Wired and wireless networks, protocols, and layers **1.10Network security** 1.10.1 Threats to computer systems and networks 1.10.2 Identifying and preventing vulnerabilities **1.11Systems software** 1.11.1 Operating systems 1.11.2 Utility software **1.12Ethical, legal, cultural, and environmental impacts of digital technology** 1.6.1 Ethical, legal, cultural, and environmental impact **(Component 2)** **2.1 Algorithms** 2.1.1 Computational thinking 2.1.2 Designing, creating and refining algorithms. 2.1.3 Searching and sorting algorithms. **2.2 Programming fundamentals** 2.2.1 Programming fundamentals 2.2.2 Data types 2.2.3 Additional programming techniques **2.3 Producing robust programs.** 2.3.1 Defensive design 2.3.2 Testing **2.4 Boolean logic** 2.4.1 Boolean logic **2.5 Programming languages and Integrated Development Environments** 2.5.1 Languages 2.5.2 The Integrated Development Environment (IDE)	

Impact:

Pupils will be confident users of technology, able to use it to accomplish a wide variety of goals, both at home and in school. Pupils will be safe users of technology showing and applying the British values of democracy, tolerance, mutual respect, rule of law and liberty when using digital systems. The way pupils talk about, share, celebrate and publish their work e.g. on Python will best show the impact of our curriculum.