

## Curriculum

GCSE Computer Science is offered as an option subject at Key Stage 4 to students in Red and White pathways. In Key Stage 4 students' follow the OCR GCSE Computer Science 9-1 specification.

All topics covered are based on core knowledge (provided in a knowledge organiser) which is then applied within lessons in preparation for assessments and exams.

Throughout the curriculum below students will constantly be developing their programming skills to ensure that they are confident and competent programmers come the end of study.

### Year 10

The purpose of the Y10 curriculum is to cover the following topics – covering both component 1 (computer systems) and component 2 (Computational thinking, algorithms and programming).

#### Term 1 –

##### COMPONENT 2: 2.4.1 BOOLEAN LOGIC

Students are introduced to Boolean logic, where they are taught that electronic circuits in a computer are constructed from logic gates which can only be in one of two states.

##### COMPONENT 1: 1.2.3 UNITS

In this topic students will build on their understanding of Boolean logic and will be introduced to units of storage. Here students will understand the different measurements used in computer science and how file sizes are calculated.

##### COMPONENT 1: 1.2.4 DATA STORAGE NUMBERS

In this topic students will learn how to convert base10 numbers (denary) into base2 numbers (binary). Students will also learn how computers perform binary addition as well as understand the concept of an overflow error. Following this students will be introduced to a third number system base16 (hexadecimal) and learn how to convert between binary, denary and hexadecimal.

##### COMPONENT 1: 1.2.4 DATA STORAGE CHARACTERS

In this topic students will understand why computer systems need character set and how these characters are represented in binary form.

##### COMPONENT 1: 1.2.4 DATA STORAGE IMAGES

In this topic students will build on their understanding of binary and learn how images are stored and represented using binary. Students will also understand how image file sizes can be calculated.

##### COMPONENT 1: 1.2.4 DATA STORAGE SOUND

In this topic students will build on their understanding of binary and learn how sound is converted from analogue to digital wave through sampling. Students will understand how sound is stored using binary. Students will also understand how sound file sizes can be calculated.

#### COMPONENT 1: 1.2.5 COMPRESSION

Students will learn how computer systems use compression to reduced the size of files. Students will learn about both lossy and lossless compression and the advantages and disadvantages of each.

#### COMPONENT 2: 2.1.1 COMPUTATIONAL THINKING

In this topic students will be introduced to computation thinking and how abstraction, decomposition and algorithmic thinking is used in computer science. Students will apply this knowledge to scenarios which require them to think logically to solve problems.

#### COMPONENT 2: 2.1.2 DESIGNING, CREATING AND REFINING ALGORITHMS

Students will learn how to breakdown problems and create solutions using flowcharts and pseudocode, including using OCR Exam Reference Language. Students will learn the benefits of using trace tables to show how the values of variables change during execution of a program.

### *Term 2 -*

#### COMPONENT 1: 1.1.1 ARCHITECTURE OF THE CPU

Students will learn the purpose of the CPU and how the fetch-decode-execute cycle works. The Von Neumann architecture will be explored and students will understand how programs and data are stored in memory.

#### COMPONENT 1: 1.1.2 CPU PERFORMANCE & 1.1.3 EMBEDDED SYSTEMS

In this topic students will explore the difference characteristics of a CPU and how these impact on its performance, students are introduced to clock speed, cores and cache size. This topic also looks at embedded systems and how these differ from traditional computers.

#### COMPONENT 2: 2.2.1 PROGRAMMING FUNDAMENTALS

Students will develop their understanding of programming fundamentals and apply this knowledge not only to programs but to exam questions. Students will focus on variables, constants, assignments, inputs, outputs and operators, as well as the importance of sequence and selection. Students will also look at iteration ad how this works in programming.

#### COMPONENT 2: 2.2.2 DATA TYPES & 2.2.3 ADDITIONAL PROGRAMMING TECHNIQUES

This topic builds on the students understanding of programming fundamentals and looks at string manipulation, arrays, two-dimensional arrays, structured records. Students will also learn SQL (Structured Query Language) as well as file handling and sub routines.

#### COMPONENT 1: 1.2.1 PRIMARY STORAGE (MEMORY) & 1.2.2 SECONDARY STORAGE

In this topic students will explore the different types of primary memory and how these form part of the computer systems. They will understand the difference between ROM and RAM as well as the terms volatile and non-volatile. Students will then explore the different types

of secondary storage and the role in a computer system. They will explore the advantages and disadvantages of each and apply their knowledge to a series of written exam questions.

### *Term 3 -*

#### COMPONENT 1: 1.3.1 NETWORKS & TOPOLOGIES & 1.3.2 WIRED & WIRELESS NETWORKS, PROTOCOLS AND LAYERS

Students will develop their understanding of the two main types of networks LAN and WAN. They will explore the factors involved in network performance. Students will then look at the network in depth and learn the different types of hardware involved in a network as well as their purpose and role. Students will explore the different topologies and ways in which a network can be connects. The difference between client-server and peer to peer will be investigated and students will apply this knowledge to written exam questions. Following this students will explore how wired and wireless technologies allow for network communications including their advantages and disadvantages. Finally students explore the encryption used on network communications. Students learn about IP and MAC address and their role in digital communication and networks.as well as learning about the TC/IP layers and how this enables communication on a network and across the internet.

#### COMPONENT 2 & PROGRAMMING SKILLS

Students will spend the rest of year 10 practicing their programming skills.

## *Year 11*

### *Term 1 -*

#### COMPONENT 1: 1.4.1. THREATS TO COMPUTER SYSTEMS AND NETWORKS

This topic builds on work from year 10, here students look at the potential threats to computers systems and network environments, exploring vulnerabilities and mitigation strategies.

#### COMPONENT 1: 1.5.1. OPERATING SYSTEMS

Students will learn about the function of the operating system alongside the features of a user interface. Students will explore memory management and what is meant by multitasking. Students will then go on to study peripheral management and drivers before exploring user management and file management.

#### COMPONENT 1: 1.5.2. UTILITY SOFTWARE

Here students will look at the role of utility software including encryption, defragmentation and data compression software.

#### COMPONENT 2: 2.3.1 DEFENSIVE DESIGN & 2.3.2 TESTING

In this topic students will study defensive design considerations where they will look at issues a programmer should consider ensuring that a program caters for all likely input

values. Students will explore how data validation can be used to anticipate misuse and how authentication can be used to confirm the identity of a user. Students will then look at the importance of maintainability and practices that can be used to effectively maintain programs such as sub routines, naming conventions indentation and commenting. Students will then look at the purpose of testing programs as well as the different types of testing (Iterative/final). They will study the syntax errors and logic errors.

#### COMPONENT 1: 1.6.1 ETHICAL, LEGAL, CULTURAL AND ENVIRONMENTAL IMPACTS

In this topic students will study the ethical, legal, cultural, and environmental impact of computing on the world. Students will develop the ability to discuss the impact of technology on these issues listed. Students will explore the legislation that is applicable to computer science including the computer misuse act, data protection act, copyright, designs & patents act and the importance of software license and the different types.

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### *Term 2 -*

#### COMPONENT 2: 2.5.1 LANGUAGES

Students will study the high-level languages and low-level languages understanding the characteristics and purpose of each. Students will explore the importance of translators and the characteristics of compilers and interpreters.

#### COMPONENT 2: 2.1.3 SEARCHING AND SORTING ALGORITHMS

In this topic students will explore the standard searching algorithms such as binary search and linear search, they will be able to apply these algorithms to a set of data. Students will also study the standard sorting algorithms such as Bubble sort, merge sort and insertion sort, again being able to apply the algorithms to a set of data.

#### EXAM REVISION AND PRACTICE

Students will undertake a variety of revision sessions, spaced repetitional and retrieval practice to ensure they are ready for the exams.

## Key Stage 3

At KS3, we aim to provide students with essential skills and knowledge to prepare them for the next step in their academic journey and transition into KS4, whether academic or vocational. It provides children with an exciting and rigorous curriculum that addresses the challenges and opportunities offered by the technologically rich world in which we live. Pupils will gain secure knowledge and skills, encouraging them to use ICT and computing to create art, solve problems and develop computational thinking skills. Pupils will understand how computers work, how computer systems work, how to be a safe digital citizen and design and program robust solutions.

While students at primary school have a KS1/2 national curriculum that they should be taught over their primary experience, the level of complexity and activities undertaken is very broad from one feeder school to another. To support the variation in abilities and experiences, we have developed a three-year KS3 curriculum, which helps develop students' skills and knowledge. The curriculum allows students to experience lessons where key aspects of the national curriculum are delivered to all and not dependent on their previous experiences. Learner's experience differentiated resources and tasks to progress them from emergent learners to mastery learners applying their understanding within different scenarios and contexts.

We want students to think creatively, plan accordingly and execute their skills to the best of their ability. The enthusiastic team of dedicated teaching staff delivering the course are driven to provide students with the transferable skills they will need to succeed in this ever-developing technological world we live in. The KS3 curriculum naturally lends itself to supporting students in their other studies around the school and their future studies at KS4. In conclusion, the KS3 curriculum provides the required knowledge and skills to help raise new generations of skilful, informed, and responsible citizens prepared for life in modern Britain.

Students follow a three-year curriculum journey broken down into five units of work within each year. Within each unit of work, students are also encouraged to complete one of the bronze iDEA Awards as part of their home learning, allowing them to finish the Award in year 9 and gain a Bronze and/or Silver Award in digital skills.

### Year 7

Pathway	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5
<b>Red/White</b>	Intro lessons	Using Computers effectively & safely	Computational Thinking with Go Control	Physical Programming MicroBit	Data handling & Spreadsheets #1
<b>Blue/Green</b>	Intro lessons	Using computers effectively and safely	Computational Thinking with Go Control	Physical Programming MicroBit	Data handling & Spreadsheets #1
<b>No. Lessons</b>	7	8	8	8	8
<b>iDEA Award</b>	Safe Online	E-Safety	Make a game	Random Coding	Money Management

### Year 8

Pathway	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5
<b>Red/White</b>	Understanding computer systems	Cybersecurity & Cyber Crime	HTML & Web Design	Programming with Python #1	Data handling & Spreadsheets #2
<b>Blue/Green</b>	Digital Graphics	Cyber Security - Barefoot computing	Web Design with Serif Web Plus	Programming with Scratch	Data handling & Spreadsheets #2
<b>No. Lessons</b>	8	7	8	8	8
<b>iDEA Award</b>	Innovation	Cyber Security	Internet & Web	User Interface	What is the cloud

### Year 9

Pathway	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5
<b>Red/white</b>	Databases	Networks	Legal, ethical, cultural & environmental issues	Programming with Python #2	iDEA Award
<b>Blue/Green</b>	BTEC Digital Information Technology - Component 2				
<b>No. lessons</b>	10	10	6	10	3
<b>iDEA Award</b>	Big Data	Making Websites	Digital Ethics	Problem Solving	Bronze/Silver Award