

GCSE Computer Science

We are living in the digital age. Computer scientists theorise, design, develop and apply the software and hardware for the programmes we use day in and day out. To have a good understanding of the world around us it is important to study Computer Science.

Our GCSE in Computer Science is engaging with lots of practical activities. It encourages creativity and problem solving. It encourages students to develop their understanding and application of the core concepts such as algorithm, abstraction and decomposition in Computer Science. Students also analyse problems in computational terms and devise creative solutions by designing, writing, testing and evaluating programs.

The course consists of two units - computer systems(unit 1) and programming(unit 2). Students study both units simultaneously in year 10 and in year 11.

In autumn year 10 students start learning about the physical components and their functions in unit 1. They will study the essential hardware and software that makes the computer work. They study the central processing unit (CPU) known as the brain of the computer, its memory structure and long term storage systems. The students learn about the main parts of a CPU and how it fetches, decodes and executes instructions on a computer system. Students learn about registers, cache memory, ROM, RAM and secondary storages. Students will compare and contrast the different types of secondary storages and their benefits and drawbacks.

Students must understand that computer systems in their current digital form can only deal with binary data which is 0's and 1's. So they learn about how to convert decimal numbers into binary and hexadecimal numbers at the start of unit 2. Understanding the basic functions of the key hardware, software and representations of data in binary is essential before studying the endless potential of networking where a machine can talk to and learn from another machine.

In year 10 the main focus for students in unit 2 is to learn how to write code. Students are required to write code in a high level programming language. Our students write code in Python, which is easy to learn and has a clean syntax. It is one of the most loved programming languages by developers, data scientists, software engineers, and even hackers because of its versatility, flexibility, and object-oriented features. This is built upon the text based python programming they learn in year 9.

While learning to code, students start with basic input/output statements. They use the basic programming constructs such as sequence, selection and iteration. Students also learn to code with strings, one and two dimensional arrays, file read/write and functions. Students will study searching and sorting algorithms. They will compare the efficiency and complexity of the different types of algorithm.

In the spring term students then start learning about connected systems that build a network. They study about the different types of network, their pros and cons, the hardware that connects the computers

together and the rules and protocols that govern the communications on the internet. With internet usage becoming such an integral part of our daily life, networking is becoming a common place. While increasingly connected societies have many benefits, it also brings many security threats and privacy risks. The students study about the risks and ways to avoid them.

In the summer term students tackle simple projects. This gives them the skill required to undertake an exam board set programming task(s) which allows them to develop their skills to design, write, test and refine programs using a high-level programming language.

In year 11 students study the ethical, legal, cultural and environmental concerns associated with computer systems. This unit has been designed to enable GCSE students to gain knowledge and understanding of the impact of technology on individuals, organisations, and the planet. Through a range of real-world examples, they will learn how to identify the specific type of impact, i.e. legal impacts such as the data protection act which is now known as GDPR, privacy issues with surveillance and monitoring, environmental impacts such as e-waste and landfill with old computer system and ethical issues such as loss of jobs because of automation. They will then progress to identifying stakeholders who are impacted by technology, and learn how these impacts are experienced, negated, or adapted to. Throughout the unit, learners will be encouraged to discuss their views and make use of sample long-form answers as either cloze or comprehension exercises, to further develop their rhetorical skills.

We continue to teach programming. After completing the basic programming and a long project, students learn about the different types of translators and IDE tools available that convert the high level programming code into machine code.

The mock exam on both units before christmas break gives us plenty of time to devise an appropriate revision plan to ensure that students have access to most of the contents in this subject. Before the final examination at the end of year 11 students will practice at least two past exam papers in full. We aim to give each learner the knowledge, skill and understanding so that they are prepared to study A level or other diploma courses in Computer Science.