Computer Science

Overview of the Curriculum

Key Stage 3 (Years 7, 8 & 9)

Through our Key Stage 3 curriculum students develop their theoretical understanding of Computer Science, as well as their practical and programming skills. This ensures that students achieve the aims set out by the national curriculum, including understanding fundamental concepts of computer science and being able to analyse problems in computational terms.

Students learn how the physical components of a computer work (the computer hardware) and how this computer hardware and computer software interact to create the technology we use on a daily basis. At Key Stage 3 we introduce students to Python, one of the most popular programming languages. Python is an excellent introduction to programming; its syntax is accessible to students but as a programming language it still has a wide range of applications that means students can be set a range of challenging activities. Learning Python develops the skills students need if they want to move on to more complex programming languages in the future.

Our Key Stage 3 curriculum is designed to provide a secure foundation for those students wishing to study Computer Science at GCSE level. Given the differing experiences of Computer Science in primary school, our aim at Key Stage 3 is to ensure all students are exposed to a wide range of topics but that those with some prior learning are challenged with appropriate activities.

Incorporated into the curriculum is the explicit teaching of e-safety to ensure that our students understand how to use technology safely and responsibly.

Computer Science GCSE - Key Stage 4 (Years 10 & 11)

At GCSE, we follow the AQA 8525 Computer Science specification. We believe this course covers the well-established constructs of computer science, whilst reflecting technological developments in the subject. The AQA examination papers are clearly worded and logically structured and we believe offer students every chance to achieve their full potential in the final examinations. As the course offers a choice of programming language, our students study Python.

Python allows students to develop their programming skills to a strong level for GCSE and provides transferable skills that will aid them in any future study of the subject.

The specification builds on our students' experience at Key Stage 3. Students study computer hardware and software and develop an increasing understanding of how these interact. The computational thinking skills introduced at Key Stage 3 are developed further and students study a unit on the ethical, legal and environmental impacts of digital technology on wider society.

This specification also provides the opportunity for students to undertake a programming project, although the outcome of the project does not contribute to a student's final grade. All students undertake the project but, for those with a keen interest in the subject, it is an opportunity to develop their skills beyond what is needed for the examinations.

Key Stage 5

At A Level, we follow the OCR H446 Computer Science specification. Although a different examination board to our GCSE course, we believe the OCR course offers the most appropriate progression from GCSE whilst building the skills and knowledge that would allow students to make the transition to the study of Computer Science beyond A Level. Within the course, students study a range of theory topics which include the principles and understanding linked to programming, such as hardware and software, networks, systems development life cycles and implications of computer use. Solving problems is at the core of Computer Science and the skills students develop through the course benefits not only their success in the subject but their wider learning.

The programming project element of the course allows students to focus on an area of interest and create a substantial piece of software. The course does not limit the scope of the project, meaning students can undertake appropriately challenging projects. The course supports a range of programming languages, meaning that students can carry on honing their skills in Python or challenge themselves with learning and implementing a new language, such as Java or a language from the C family.

Overview of schemes of work at each key stage

Key stage 3	Key stage 4	Key stage 5
Throughout the course of Key Stage 3, students will learn a variety of concepts taught through multiple topics of work. **Computational skills include:** ● Computational Thinking ● eSafety ● Encryption ● Decryption ● Creating algorithm ● Binary conversion **Practical skills:** ● Spreadsheet skills ● Programming in Python ● Programming Computer Hardware ● Online drawing software ● Creating a website using HTML **Computational knowledge:** ● Hardware components ● Laying out algorithms using pseudocode/flowcharts ● Ethical, moral and social landscape ● Machine Learning and how AI interact with both themselves and humans The topics are spiralled in such a way	Throughout Key Stage 4, students will be able to apply their previously acquired knowledge (from Key Stage 3) in order to advance through a series of topics that build in complexity. **Computational skills include:** ● Computational Thinking ● Searching and Sorting ● Encryption ● Compression ● Creating algorithm ● Programming ● Binary conversion **Practical skills:** ● Creating/Setting/Querying a Database ● Fundamental and Advanced Programming Concepts **Computational knowledge:** ● Hardware components ● Laying out algorithms using pseudocode/flowcharts ● Ethical, moral and social landscape ● Binary maths	<u>Year 12</u> **Teacher 1:** Unit 1 - Computational Methods Unit 2 - Structure/Function of a Processor Unit 3 - Types of Processor **Teacher 2:** Unit 1 - Input/Output/Storage and System Lifecycles Unit 2 - Compression and Encryption Unit 3 - Databases <u>Year 13:</u> **Teacher 1:** Unit 1 - Networks Unit 2 - Web Technologies Unit 3 - Data Types Unit 4 - Data Structures Unit 5 - Boolean Algebra Unit 6 Thinking Abstractly/Concurrently Unit 7 - Programming Techniques **Teacher 2:** Unit 1 - Systems Software Unit 2 - Application Generation Unit 3 - Programming Languages Unit 4 - Legislation Unit 5 - Ethical and Social Unit 6 - Thinking Ahead Unit 7 - Thinking Procedurally/Logically Unit 8 - Algorithms

that completing the Year 7 topics builds the foundations for our Year 8 topics and so forth.

For 2022/23 the units studied are:

Year 7:
Unit 1: Google/eSafety
Unit 2: Computational Thinking
Unit 3: Cryptography
Unit 4: Computer Hardware

Year 8:
Unit 1: Data Modelling
Unit 2: Flowol & Control
Unit 3: Logic Gates
Unit 4: Introduction to Python Programming

Year 9:
Unit 1: The Appliance of Computer Science
Unit 2: Logo Programming
Unit 3: Machine Learning and AI
Unit 4: Ethics

Year 10:
- Unit 1 - Fundamentals of Algorithms
- Unit 2 - Fundamentals of Programming
- Unit 3 - Advanced Programming
- Unit 4 - Databases & SQL
  Unit 5 - Binary and Computer Maths
- Unit 7 - Programming Project

Year 11
- Unit 6 - What's Inside? (Computer Hardware)
- Unit 8 - Networks
- Unit 9 - Ethics
- Unit 10 - Decoding the Exam