QESixth

Why study Computer Science?

Welcome to Computer Science – don't worry if you didn't study it at GCSE, this might still be the subject to add substance to your Sixth Form life. In a digital world, having a grasp of the concepts that drive it can help you, no matter what else you plan to study. More and more people are beginning to realise that learning to think like a computer scientist is a good thing. Thinking logically, reasoning, breaking complicated things down and being able the express instructions so precisely that even a dumb computer can understand you are, we think, essential attributes for a 21st century student. Of course, you may be just completing your Computer Science GCSE. If so, you already have a bit of an idea about what's involved, though there is plenty still to discover. But for those who don't know what it's about, read on…

Computer Science isn't just for techies. In fact the subject has totally changed in recent years – and that's why we're looking to a new generation of students who realise that understanding how the digital world works, and how you can harness it for your needs are important skills for many university courses and the research they entail. Students who study Computer Science at A Level dig below the surface and find out, for example, how the Internet really works. Or get to know how music can be compressed so it fits on their iPod. Or find out how to use Python, the programming language we use, to model real world problems.

Now here's the real deal with Computer Science. First up, the good news is that we take a gradual approach. You don't develop such advanced skills overnight so we give you good resources and time to practise. But the bad news is that this is no easy option. You need a bit of a 'maths brain' for this so a '6' in GCSE maths is required. And whilst we don't insist on a GCSE in the subject, if you have studied it, we would expect a '7', or '6' at the very least.

What will you be learning?

There are 12 different areas of Computer Science covered over the two year course, but they are all interlinked. One major focus is all about **Problem Solving, Programming, Algorithms and Data Structures.** This is where we get to grips with a range of big ideas. The main thing is to get you programming. We'll do a series of practical exercises, to get your computational thinking honed, then in April you get a big problem to solve - a major programming exercise. By the time you've done that you're ready to try a whole new type of exam in Year 13. No paper here—an on screen test involving practical programming. As your skills build we explore different approaches so you're well placed to also take on a major programming project that runs through much of the second year.

Alongside this are several topics that are all about FUNdamentals. These are the key ideas behind **Computer Systems, Networks, The Internet and Big Data**. This is where we 'lift the bonnet' and the focus shifts to look at two things—the principles that explain how a program

actually runs and reasoning about how computers can communicate with each other. So we look at the basic ideas behind what makes a computing machine and how it handles instructions and information. We also look at the key concepts of networking and explore how the mother of all networks, the internet handles the billions of requests it is constantly bombarded with, and the challenges posed by its explosive growth. We also explore some interesting ethical issues brought about by the digital revolution.

What are lessons like?

The lessons are split roughly in half. Practical lessons are focused on getting your programming skills up to speed so initially there are loads of short problems to get your head around. These are designed to develop the techniques used to write ever more complicated programs. It's not easy, and we'll expect you to be doing a lot of programming in your own time. The more you do, the better you get. There is nothing that matches the excitement of getting your code to work—particularly if you've been grappling with it for ages! We live for the 'it works' moment! Lessons introducing theoretical concepts are varied. Practical exercises are often used to illustrate some of the key concepts you need to be familiar with. If you want to get a taste for what they are like, it is best to talk to some of the current sixth form Computer Science students.

What can it lead to?

The work in Year 13 steps up to look at tools and techniques used in big systems. You'll tackle a practical programming exam, so plenty more focus on **Problem Solving and Programming.** On the theory side we take things to a much greater depth and ask some key questions about the way the digital world is heading. So we delve into the world of **Big Data and gigantic systems** – the stuff that drives much of the scientific research being carried out today. We also look in more detail at some of the key theoretical ideas that underpin computing: we ask what a computer is, what it can and can't do, look at different ways to approach program design, imaginative ways to search, sort and store data and ways to measure which are best. This is real theory—the key ideas behind what is, and isn't computable. Finally a **Computing Practical Project** takes your programming to greater depths. Beyond that, there are various Computer Science degrees available. If you already know you want to study this further, it's worth thinking about doing Maths A level as well, as some universities require this to study at a higher level. But many other degree subjects now benefit from a knowledge of computing. The onus throughout is on developing Computational Thinking – a special way of approaching problems that will have real benefit for your broader education, whatever course or career you decide to pursue.

Want to know more?

To find out more about the course and discuss your suitability please contact A.Chambers@qes.org.uk