

A Level Presentation Notes



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What is Computer Science?

'Computer Science is the new Latin'

'It's the closest that students get to thinking about thinking'





Computer Science prepares students for a world that does not yet exist

Computer Science is a discipline, just like Maths or Physics. It has a body of knowledge, established techniques, and thinking skills, that will last students a lifetime. The core skill-set of Computer Science is independent of new technologies and programming techniques. It comprises of computational thinking, problem solving, analytics and logic.

As the Computer Scientist Dijkstra said: 'Computer science is no more about computers than astronomy is about telescopes'

Computer Science is shaping the world that we live in:

Here are some recent quotes from Ray Kurzweil who is now Head of Engineering at Google. He predicts that by the 2030s we will be able to upload our brains to the cloud and supplement our intellect with artificial intelligence. This will apparently work by using nanorobots, tiny robots that can enter the blood stream. Although nanorobots are still theoretical, some sources say that we are very close to being able to produce them. Kurzweil is an inventor, author and Computer Scientist and in the past 85% of his predictions have been correct. Google are currently reported as purchasing every Artificial Intelligence company that they can find and spending billions.



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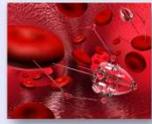
Why take Computer Science?

Computer Science is shaping the world we live in

'By 2030 human beings will be hybrid'

'By 2045 computers will be a billion times more powerful than all of the human brains on Earth' Ray Kurzweil

'Mining big data yields Alzheimer's discovery'
Manchester University

We are at a very exciting time in Computer Science. Many people believe that this is only the very beginning of what we can achieve perhaps through the development of 'quantum computing' - using the power of atoms to perform memory and processing tasks



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Course Content

Topics

- 1 Fundamentals of programming
- 2 Fundamentals of data structures
- 3 Fundamentals of algorithms
- 4 Systematic approach to problem solving
- 5 Theory of computation
- 6 Fundamentals of data representation
- 7 Fundamentals of computer systems
- 8 Fundamentals of computer organisation and architecture
- 9 Consequences of uses of computing
- 10 Fundamentals of communication and networking
- 11 Fundamentals of databases
- 12 Big Data
- 13 Fundamentals of functional programming
- 14 Practical project




I am going to use a course that has been designed by the AQA examination board

These are the subject areas. There is a steep learning curve when studying GCSE but as long as you overcome these obstacles and master Computational Thinking, there is not the same learning curve when beginning A Level. You should recognise a lot of these areas. Obviously, they are studied at a higher level but anyone currently studying GCSE at this school who has completed the more advanced tasks that I have posted on line e.g. Bubble Sorts, Insertion Sorts etc. has already started the A Level.

Topic 9 The Consequences of Computing are an important part of the course looking at the moral, ethical, legal and cultural consequences and opportunities. Just because we CAN do something SHOULD we do it. A number of tech billionaires have donated to a fund to protect society from AI

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Fundamentals of Algorithms refers to a more in depth study of algorithms and their efficiency usually undertaken in year 2.

Discrete maths is now a bigger part of the syllabus. Students will study how:

- To simplify Boolean expressions so that circuits can be designed using less logic gates
- To find the shortest path using Dijkstra's algorithm in Graph Theory to get an understanding of how devices like SatNavs work
- To use Big O to compare algorithms in terms of efficiency
- To manipulate vectors and matrices for example, in order to change sound and image files

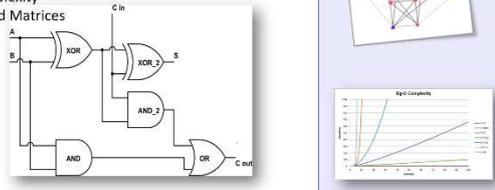


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Discrete Maths

The new curriculum contains:

- Boolean Algebra
- Graph Theory
- Big O Complexity
- Vectors and Matrices





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Assessment

A Level Assessment			
Assessment	Duration	% of A Level	Topics
On-screen Exam	2 ½ hours	40%	1 - 5
Written Exam	2 ½ hours	40%	6 – 13
Coursework	n/a	20%	4 and 14



We no longer have AS and so all assessment is at the end of year two, although students will still take an internal AS style exam at the end of Year 1.

You can see from this table that coursework accounts for 20% of the qualification.

The on-screen exam requires the students to code in Python. They are given a skeleton programme to study a few months before the exam and they have to extend it in exam conditions.

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Higher Education

Do I need to take the A level to study Computer Science at university?

- After advanced level study you will know if it's the right choice for you
- Universities expect you to demonstrate your interest in the subject at interview and obviously this is easier if you have had more experience in this area
- It's a great discipline and the skills are easily transferable
- It's a great course



Facebook Offices



A Google sleep pod

Number one is the most important.

I am going to use a range of software and mobile apps so each student will be issued with a Surface Pro 4 for the duration of the course. This will ensure that all students have the correct software installed.

The students will also be given an Office 365 account.

All of the resources for the course will be available online on my Virtual Learning Environment



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eLearning

- Each student on the course will be given a Surface Pro 4
- The resources for the course will be available via a Virtual Learning Environment (VLE)
- Pycharm and Jupyter notebooks will be used to write Python code
- In addition to Python, students will learn the functional programming language Haskell and Matlab




Computer Science Joke



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A Computer Science joke

There are 10 types of people in the world

.....Those who understand ternary, those that don't and those that confuse it with binary