

**A Level Computer Science**

**Lecturers**
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**Activity 1 -** Networking

Interconnected devices are at the heart of the contemporary digital landscape, networked smart devices over the Internet create the ‘Internet of Things’. This creates many benefits for consumers and organisations, such as increased efficiency of energy use, convenience and the ability to manage and report on data at incredible speeds.

Many modern cars are now classed as smart devices, as they have the ability to connect to the Internet, as well as each other. We call this approach of interconnecting devices locally a **Local Area Mesh Network (Mesh LAN)**. Tesla utilise this approach to send updates to their cars ‘Over the Air’.

* Research and explain three of the key benefits of utilising a Mesh network **topology** for standard devices within organisations; would we use this for every computer in an office, or not?
* We use an Internet Protocol (IP) address to uniquely identify devices on a network, similar to how the postal system can use your house’s unique address to send you mail. Many countries are moving to an IPv6-based network, away from IPv4; what are the main reasons and key drivers for this?

**Activity 2** – Program design

You have been asked to create the design – not the code – for a simulation of a procedurally-generated stellar system. The user will be able to select a ‘generate’ button, this will trigger the software to:

* Select the size of a star, between one and 6 “units of mass”
* Select the number of planets orbiting the star, based on the mass of the star, such that:
	+ *n\_planets = 1.5\*m\_star + 2*
* Select the distance from the star for each planet, between 0.1 and 20 Astronomical Units (AU)
* Select the mass of each planet, based upon the distance from the star, such that:
	+ *m\_planet = d\_star (AU) / 3x105*
* Select the number of moons for each planet, such that:
	+ n\_moons = m\_planet \* 3x105 + (2 > *n* >= 0)
* Render these objects in orbit, on the screen – a user can select an object to find out more about it
* The user can choose to ‘save’ the stellar system into a database under their unique user account, to load back again later

Your design should include:

* Initial sketches/diagrams of what the User Interface (UI) will look like
* A software flow diagram, which will outline the calculations and steps taken by the software
* A list of what data would be stored within a database, for the user’s account and the scientific data
* A list of eight requirements for the software
* A justification of a suitable programming language

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**Frequently asked questions**

**How is this subject assessed?**A Level Computer Science is assessed via two exams and a piece of coursework, a software project called Non-Exam Assessment (NEA). Throughout the course, we will thoroughly prepare you for the exams with skills development, exemplar answers and practice questions, as well as support for creating your project.

**Do I need to know how to program?**If you already know a programming language, be it Python, C# or something else – that’s fantastic! This will give you a helping start in creating your project, as well as some of the programming assessed via exams. However, we will teach you to program from C# starting from the very basics, fully preparing you for University.

**Do I need to do A Level Computer Science to study Computer Science at university?**The short answer is no, it is not a requirement, however studying A Level Computer Science will give you a really good idea of what it is like to study Computer Science at university and help inform your decision. You are also at an advantage if you go on to study Computer Science at university, as many of the fundamentals of Computer Science are covered on the A Level and are mandatory units in the first year of University. You will also find it much easier at University if you can already program to a good level.

**What trips / guest speakers are there?**In Computer Science, there are several extra-curricular opportunities, in recent years we have had guest speakers from industry, such as WPA, EDF HPC, NHS Digital and other local employers. We always involve students in decisions surrounding trips and we look forward to an annual trip to a gaming convention, such as EGX.

**What other subjects does A Level Computer Science go with?**A Level Computer Science is a versatile subject the compliments study of many other areas, Computer Science students typically tend to study the subjects alongside subjects such as Maths, Further Maths, Physics and Chemistry. However, it is important to note that almost all fields now have requirements of excellent digital literacy!

**Recommendations**

* Tom Scott and Computerphile provide fantastic YouTube videos that explain a lot of the key principles of Computer Science in interesting ways.
* I would recommend attempting to learn C# before you start the course – Codeacademy have a free course available [here](https://www.codecademy.com/learn/learn-c-sharp), or the W3Schools content available [here](https://www.w3schools.com/cs/).
* Network Chuck on YouTube explores lots of modern, interesting software and topics that are interesting for expanding your skills past A Level standard.