COMPUTER SCIENCE

Why is the study of Computer Science important?

Computer Science is the study of the principles and use of Computers. Its study will make you question how the systems that you use in a modern day society work and encourage you to explore the concepts behind the technology you use and to develop skills to become a creator of technology yourself.

From Year 7 you will have the exciting opportunity to develop and consolidate basic ICT skills that will allow you to access more complex Computer Science concepts. From there you will study the four cornerstones of Computational Thinking, these are crucial as they can be applied to any Computer Science context and will provide firm foundations for other topics within the subject. From this, key programming constructs can be learnt, allowing you to develop programming skills in more than one environment, this will help you to understand key similarities between different programming environments and develop key skills in problem solving and debugging. These skills will be further consolidated and mastered in text based programming languages throughout your study, applying the cornerstones of Computational Thinking in a wealth of scenarios to develop your problem solving skills.

Computer Science theory is also explored, looking 'under the bonnet' of the computer systems that you use on a day-to-day basis. Key systems hardware are investigated, including how networks are formed, the inherent security risks that networked devices produce and how to mitigate against these risks. Computer Security is currently one of the biggest risks to national security, is relevant, interesting, and provides you with knowledge that can help you become a responsible e-citizen. Your study of Computer Science will encourage you to think deeply and help you more effectively to become a resilient problem solver that understands the technological world in which we live – a great life skill that all universities and employers will appreciate.

Across your study you will explore fundamental principles and concepts of Computer Science, including abstraction, decomposition, logic, algorithms, and data representation. You will analyse problems in computational terms through practical experience of solving such problems, including designing, writing and debugging programs. Furthermore, the subject will teach you to think creatively, innovatively, analytically, logically and critically and understand the impacts of digital technology to the individual and to wider society. Lessons will provide a wide range of opportunities for practical application of key concepts through a chosen programming language as well as plentiful opportunities for you to investigate how computers work. In addition, there will be opportunities for extended discussion about the ethical, moral and social implications of technology in society.

Computer Science offers a significant challenge, this is because it is a subject that encourages technological progress and breaking new ground, but this is what makes it exciting! Can you apply the concepts, knowledge and skills you have learnt in a creative way that others haven't thought of before? Can you identify an area of Computer Science that provides further technological development? Seems challenging – but you are going to love it! Computer Science will expand your mind!

Big Questions will be explored such as:
- Are the developments in artificial intelligence affecting job prospects and opportunity?
- Is technology creating a digital divide that further disadvantages people in developing countries?
- Can you create a program for a specific scenario to solve a problem?
- What opportunities and issues does the internet develop?

All of these questions are key and can be explored by understanding key Computer Science concepts both through theory and practical application. I bet you can't wait to get started!

What skills will the study of Computer Science teach you?

You are a citizen in this world and you need to know how to solve problems using technology and the key concepts involved in the technology that we have become so dependent on. It will teach you to:

- Apply computational thinking techniques (abstraction, decomposition, pattern recognition, algorithms) in a range of scenarios to solve problems.
- Develop resilience by not being afraid of challenges when solving problems, but to break them down and keep trying.
- Be creative in a subject that may not be renowned for it – there is no limit to creativity when you create the solution.
- How to act responsibly online to ensure that you and others stay safe online.
- Identify the key programming constructs (sequence, selection, iteration) required to solve a problem.
- Apply the key programming constructs (sequence, selection, iteration) to any programming language.
- Work independently and as part of a team to solve complex problems.
- Construct reasoned arguments to ethical, social and moral problems that have arisen due to technology and communicate these in an effective way.
- Identify links between different elements of Computer Science.
- Evaluate different methods of representing data and decide on the most suitable method for presentation/storage.

How does your study of Computer Science support your study in other subjects?

Study of any subject in our curriculum takes full advantage of links with other subject areas - we term these as interdisciplinary links and we make the most of them because we know that deep learning requires the transference of knowledge and skills from one topic of learning to another. You will learn methods of thinking and research that are widely applicable to other subject areas helping your thinking in all subjects. Once you can transfer your learning across topics and subject areas then you are really mastering what you know and how to apply your understanding and skills.

Computer Science touches on so many other subjects such as mathematics as you develop skills in problem solving, including decomposition (breaking down problems), abstraction (removing unnecessary detail from a problem) and pattern recognition. All of these skills will support your teaching in mathematics as these are very important in being able to solve mathematics problems in a range of contexts. There are also links with science as binary logic can be applied to electrical circuits in physics and much of the technology from Computer Science can be mapped back to core principles of science. For example, how sensors are used to monitor motion, force and/or pressure.

How can you deepen your understanding of Computer Science?

The Computer Science department offers lots of great opportunities for you to really engage with this fabulous subject. In Year 7 and Year 8 we engage with an external program called iDEA (Inspiring Digital Enterprise Award). This is an online program that students can complete in addition to their lessons to develop digital and enterprise skills. It is the digital equivalent of the Duke of Edinburgh programme. Why not continue the iDEA programme at home to complete your bronze award? See if you can complete all the badges, develop your digital literacy and enterprise skills and compete against other students in the Trust.

Across Years 7 to Year 11, students engage in the Bebras Challenge. This is a national competition run by Oxford University that assesses Computational Thinking skills. Students have the opportunity to take part in this competition and if they are in the top 10% nationally, they will be invited to Oxford University to take part in a new challenge.

In Tutor Group you complete Computational Thinking challenges, these are examples of the types of challenges you will have to complete individually in the Bebras challenge. Do you enjoy doing these? Do they provide mental stimulation and a challenge to you? If so, ask your teacher about how to enter the Bebras challenge.

Get involved! Become a Computer Scientist!

How are you assessed in Computer Science?

Throughout the Computer Science course you are assessed using the following assessment objectives which ensure that you can cumulatively build your subject understanding in preparation for future GCSE and A Level study. There are assessment points each year that we term Praising Stars©.

For younger years we base our assessment on our subject mapping of the age-related expectations across the curriculum, assessing students' performance at their current stage of study against expectation. At GCSE we make informed predictions informed by our holistic assessment of students' progress against the key assessment objectives and their aspirational GCSE targets. These are also the basis for any appropriate support and intervention.

Key Assessment Objectives
AO1
Demonstrate knowledge and understanding of the key concepts and principles of Computer Science.

A02
Apply knowledge and understanding of key concepts and principles of Computer Science.

A03
Analyse problems in computational terms:
- to make reasoned judgements
- to design, program, evaluate and refine solutions.

How can Computer Science support your future?
Computer Science is offered at most sixth form colleges and prestigious universities either as a single honours or a joint honours subject studied alongside other disciplines e.g. Computer Systems Engineering, Computer Games Design, Computer Science & Artificial Intelligence, Mathematics & Computer Science and Computer Forensics. The very fact that you have been able to study Computer Science e.g. computational thinking will help your future applications be they for colleges, universities, apprenticeships or employment.

Careers that the study of Computer Science supports include:
- Database Administrator
- Software Developer

- Web Application Developer
- Computer Systems Analyst
- Mobile App Developers
- Information Security Analyst
- Computer Network Architect
- Software Tester
- Network Manager

GCSE COMPUTER SCIENCE PROGRESSION PATHWAY AT OUTWOOD ACADEMY BYDALES		
Term	Year 10	Year 11
Autumn 1	Algorithms and problem solving	Networks
Autumn 2	Representing data in computer systems	Networks 2
Spring 1	Programming fundamentals	System security
Spring 2	Producing robust solutions	Ethical, legal, cultural and environmental impacts of digital technology
Summer 1	Systems architecture	Knowledge retention and recall
Summer 2	Memory and Storage	Exam paper 1 and 2

KS3 COMPUTER SCIENCE AND DIGITAL LITERACY PROGRESSION PATHWAY AT OUTWOOD ACADEMY BYDALES	
E-Safety	Small Basic Programming
Computational Thinking	Running for Prime Minister
G-Suite Applications	Programming in Python
Micro:Bit Programming	Events That Changed Our Time
Computing Theory	HTML Web Design
	What is Artificial Intelligence?