



## COMPUTER SCIENCE & ICT

### **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 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 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?*

### **Why is the Study of Level 1/2 Vocational Award ICT (Technical Award) important? (Year 11 completing in June 2024)**

WJEC Level 1/2 Vocational Awards (Technical Awards) provide learners with opportunities to study vocational subjects alongside GCSEs and other general and vocational qualifications as part of a broad programme of study. Students will learn a wide range of key ICT skills. Vocational ICT is a skills and knowledge based course which aims to give students the ICT foundation they will need in future life. During this course, students can expect to develop practical skills in office software and develop their understanding of information communication technology

### **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 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

### **What will you know and understand from your study of Computer Science?**

- How computers process data, the architecture of a CPU (von Neumann) and the characteristics that affect the performance of computer systems
- Different types of computer system and how embedded systems are used in society
- Methods of storage within a computer system, including primary and secondary storage
- How to calculate storage requirements for a range of different types of file
- The suitability of different storage devices based on capacity, cost, speed, portability, durability and reliability
- Different types of networks and factors that affect the performance of networks
- Hardware required to create a network and the different responsibilities of the different type of hardware
- How the internet is used for access to the WWW and online storage
- How the TCP/IP (the rules used to send data across a network) stack works, the different protocols related to each layer and their roles
- Threats to network and system security and how to prevent/overcome these problems
- Different types of software (operating systems and utility software) and their roles within a computer system
- Ethical, cultural and environmental issues that have arisen due to technology
- Different legislation that relates to computers and technology
- Different searching and sorting algorithms and how they are used

- The key programming constructs (sequence, selection and iteration) and how these can be written in a text based programming language
- The use of file handling in a programming language
- How SQL (structured query language) can be used to query and interrogate data
- The use of data types, arithmetic, Boolean and string manipulation when creating programs
- Different defensive design considerations for creating robust programs and how to implement these in programming
- How to generate test plans for a range of different scenarios
- Applying computational logic to generate truth tables for logic circuits.
- How translators are used to deal with different types of programming language
- How data is represented in computers, including binary, hexadecimal, characters, images and sound
- How compression is used in computer systems.
- How to select and combine multiple applications to achieve challenging goals, including collecting and analysing data and meeting the needs of a given scenario

### **What skills with the study of Level 1/2 Vocational Award ICT (Technical Award) teach you?**

The skills you will learn and develop through Level 1/2 Vocational Award ICT (Technical Award) include:

- The wide use of Hardware in society.
- The use of application and specialist software.
- How information is used in a wide range of contexts including businesses, education and homes.
- Legal, moral and ethical implications of using ICT.
- Environmental impacts of using ICT.
- How data and information are transferred.

- Extensive spreadsheet knowledge and skills, including Formulas, Functions, Formatting, Conditional Formatting, Macros and More.
- Extensive knowledge of databases, including Queries, Table designs, Data Types and More.
- Knowledge of editing digital images.

Understanding how to solve problems in a vocational setting.

### **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. 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 problems 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. You will learn methods of thinking and research that are widely applicable to other subject areas helping your thinking in all subjects.

### **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 & 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 an initiative from the Duke of York and is the digital equivalent of the Duke of Edinburgh programme.

Across year 7 to 11 students also have the opportunity to get involved in the First Tech Robotics challenge as their enrichment. Whilst being an incredibly enjoyable option, it is also an opportunity for you to develop your skills in programming, design, construction, teamwork and project management, all very useful skills in the professional world. The project will culminate in your robot going up against other schools in the area and possibly the chance to compete nationally or even internationally depending on the success of your robot!

Get involved! Become a Computer Scientist!

## **How does your study of Level 1/2 Vocational Award ICT (Technical Award) support your study in other subjects? (Year 11 completing in June 2024)**

The design principles and the skills you learn in Level 1/2 Vocational Award ICT (Technical Award) are directly transferable across all subjects in the curriculum. The design principles learnt when developing digital graphics may be used in a wide range of subjects and industries later in life. The extensive spreadsheet knowledge you will develop will provide key skills that can be utilised in many other subjects such as maths and science whilst also being of great benefit in future careers.

## **How are you assessed in Computer Science?**

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 half termly assessment points each year that we term Praising Stars®. In younger years we use our subject mapping of our curriculum's age related expectation to assess how students are currently performing against their age related expectations at this point in their study. At GCSE we make informed predictions informed by our holistic assessment of their 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**

**A01:** 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 are you assessed in Level 1/2 Vocational Award ICT (Technical Award)? (Year 11 completing in June 2024)**

Level 1/2 Vocational Award ICT (Technical Award) is assessed through 2 compulsory units.

- Unit1: ICT in society is a 1 hour 20 minute on screen examination. This is worth 40% of your overall grade.



Unit 2: ICT in context is a controlled assessment coursework that is worth 60% of your grade.

### **How can Computer Science support your future?**

Of course we offer the study of GCSE and A Level Computer Science and we encourage your continued study in this fantastic subject. Yet we know that choice and personal interest are important aspects of worthy study. Whether you have continued your study of Computer Science into GCSE or A level or not you will have gained access to this enriching subject and its study will have taught you to think differently and deeply.

Computer Science is offered at most 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 application be they for colleges, universities, apprenticeships or employment.

Careers that the study of Computer Science supports include:

- Secondary School Teacher
- Database administrator
- Software Developer
- Web Application Developer
- Computer Systems Analyst
- Mobile App Developers
- Information Security Analyst
- Computer Network Architect
- Software Tester
- Network Manager

### **How can Level 1/2 Vocational Award ICT (Technical Award) support your future?**

There are a wide range of ICT & media based courses offered post-GCSE students at colleges and sixth form providers including our own. Within Outwood we offer an ICT qualification that utilises the skills learnt in **Level 1/2 Vocational Award ICT (Technical Award)** and this is deliberate to ensure progression between stages of study. Due to **Level 1/2 Vocational Award ICT (Technical Award)** being a wide ranging

curriculum this allows for many avenues to be explored into higher and further education. There are a vast range of courses offered at university that target digital media, either through the production, design or publicising through this media.

Careers that the student of **Level 1/2 Vocational Award ICT (Technical Award)** supports include:

- Secondary School Teacher
- Web designer
- Graphics design
- Video production
- Social media publicist
- Media Marketing Director

CURRICULUM PROGRESSION PATHWAY FOR CORE COMPUTER SCIENCE AT OUTWOOD ACADEMY CARLTON			
	YEAR 7	YEAR 8	YEAR 9
Autumn 1	safety  Computational Thinking	safety  Computer Theory - Number systems, binary logic	safety  Programming - Sonic Pi



<b>Autumn 2</b>	Computational Thinking  IT Project - Word processing, spreadsheets	Computer Theory - Sequencing instructions, images, sound  Digital Literacy - Events that changed our time	Programming - Sonic Pi  Programming - Python  Photoshop
<b>Spring 1</b>	IT Project - Word processing, spreadsheets  Micro: bit - text based programming	Digital Literacy - Events that changed our time  Programming - Python	Photoshop  Digital Literacy - Outwood Travels
<b>Spring 2</b>	Micro: bit - text based programming	Programming - Python	Digital Literacy - Outwood Travels  Theory - Networks

<b>Summer 1</b>	IT Project - presentations	Digital Literacy - Outwood Production	Theory - Networks
<b>Summer 2</b>	Small basic - text based programming	HTML & Web Design	Digital Literacy - Learning for PM

<b>Key Stage 4 Computer Science</b>		
	<b>YEAR 10</b>	<b>YEAR 11</b>
<b>Autumn 1</b>	Python Programming Skills Building  2.2 Programming Fundamentals	Programming Practice  Component 1 Revision - Systems Architecture, Storage, Networks



	2.1 Algorithms	Component 2 Revision - Algorithms, Programming Techniques
<b>Autumn 2</b>	Python Programming Skills Building  1.2 Memory and Storage	Programming Practice  Component 1 Revision - Networks, System Security, Systems Software, Ethical, Legal, Cultural and Environmental Concerns  Component 2 Revision - Programming techniques, producing robust programs, computational logic, translators



<b>Spring 1</b>	Python Programming Skills Building  2.2 Programming Fundamentals  2.5 Programming Languages & IDEs  2.4 Boolean Logic  2.3 Producing Robust Programs	Programming Practice  Component 1 Revision - Data representation, Systems architecture, Memory, Networks  Component 2 Revision - Algorithms, Programming techniques, producing robust programs
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<b>Spring 2</b>	Python Programming Skills Building  2.1 Algorithms  2.2 Programming Fundamentals	Programming Practice  Component 1 Revision - Systems Security, Systems Software, Ethical, legal, cultural and environmental concerns  Component 2 Revision - Computational logic, translators and facilities of languages
<b>Summer 1</b>	Python Programming Skills Building  2.2 Programming Fundamentals  1.1 System Architecture  1.2 Memory and Storage	Exam Prep



<b>Summer 2</b>	Python Programming Skills Building  1.2 Memory and Storage  1.3 Computer Networks, Connections and Protocols	Exam Prep
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**Key Stage 4 Vocational ICT**



	<b>YEAR 10 - Vocational ICT</b>	<b>YEAR 11 - Vocational ICT</b>
<b>Autumn 1</b>	Spreadsheets - Introduction, Functions and Formulas	<p>Spreadsheet and Photoshop- Assessment based on scenario</p> <p>Unit 1- ICT in Society theory- Inputs, outputs, storage, computer components, system and utility software, IT services</p>
<b>Autumn 2</b>	Databases- Introduction, Data validation, reports and queries	<p>Assessment- Based on theory (Unit 1)</p> <p>1.2- How input data is checked for errors</p> <p>1.2- How data transfers over different types of network</p> <p>1.2- Different types of connectivity</p>





<p><b>Spring 1</b></p>	<p>Automated documents skill building</p> <p>Unit 1 - Risks to information held on computers, The impact of data loss, theft or manipulation, Methods used to protect information</p>	<p>1.3 - The impact of data loss, theft or manipulation</p> <p>1.3 - Methods used to protect information</p> <p>1.3 - How moral and ethical issues affect computer users</p> <p>1.3 - How legal issues protect computer users</p> <p>1.3 - The cultural, personal and environmental impact of ICT</p> <p>1.3 - How a digital footprint can impact computer users</p>
<p><b>Spring 2</b></p>	<p>Editing and creating digital images</p> <p>Automated documents skill building</p> <p>Unit 1 - The cultural, personal and environmental impact of ICT, How a digital footprint can impact computer users</p>	<p>Assessment- Databases based on scenario</p>



<b>Summer 1</b>	Database and digital images - assessment based on scenario	Assessment- Databases and Automated documents based on scenario
<b>Summer 2</b>	Spreadsheets- Assessment based on scenario	Exam Prep

