

Computer Science

Course overview

Computer Science is an exciting new discipline at Bishop Luffa School and we have designed a curriculum to meet the needs of 21st century pupils. We aim to develop the pupil's logical thinking and problem solving, and computational thinking skills by combining three major areas of study. First, at the heart, is computer science, which covers all the basic theory of how computers work and how we can use them. Second is information technology; this integrates the use of popular software such as Microsoft office and many others. Third, is digital literacy, which includes e-safety and the responsible use of computers and the internet?

Pupils are regularly assessed during lessons and at the end of topics to monitor progress. Pupils are also expected to monitor their own progress and set themselves personal targets to help their learning. Each pupil has a school target 'step', which they are working towards.

There are 6 key areas of assessment in computer science.

1. Algorithms – developing solutions to problems.
2. Programming & Development – building software.
3. Data & Data Representation – how data is used.
4. Hardware & Processing – computers and how they work.
5. Communication & Networks – the internet.
6. Information Technology – use of software for different tasks.

Year 7

All pupils joining in Bishop Luffa in Y7 are introduced to e-safety and the responsible use of the internet. Pupils then go on to begin to understand how to solve simple problems using programming.

Topic 1 – E-safety and the responsible use of the Internet.

Topic 2 – Basic Programming using PowerPoint – Who wants to be a millionaire

Topic 3 – Simple text based programming – Logotron

Topic 4 – TV Advert creation– develops a range of skills

Topic 5 - Scratch – Visual Programming with code blocks.

Year 8

Pupils develop their skills further this year in many of the 6 areas of assessment as we dig deeper into the theory and programming elements of computer science. KODU Xbox style game creation is a popular topic – with a competition, run by Microsoft that pupils can enter. This year, 2015, we have one team in the final, which cumulates in a visit to the Microsoft campus.

Topic 1 – E-Safety – Digital literacy

Topic 2 – Sequential Programming with Flowol – developing control systems for real life situations

Topic 3 – Flash - How to animate using this popular tool.

Topic 4 – Jump on the bandwagon – website creation using Dreamweaver.

Topic 5 – KODU. Xbox style game creation, Visual programming

Topic 6 – Introduction to Python – Text based programming.

Year 9

This is the final year of KS3 before individual options for GCSE are taken up in Year 10. During this year we aim to strengthen and reinforce pupils' skills and knowledge as they move on to GCSE.

Computer Science Steps – Algorithms

Step	Competency
1	<ul style="list-style-type: none"> ▪ I can design solutions (algorithms) that use repetition and two way selection (if/else) ▪ I can use diagrams to express solutions ▪ I can use logical reasoning to predict outputs, showing an awareness of the inputs
2	<ul style="list-style-type: none"> ▪ I can show an awareness of tasks best completed by humans or computers ▪ I can design solutions by decomposing a problem and create a sub-solution for each of these parts (decomposition) ▪ I know that different solutions exist for the same problem
3	<ul style="list-style-type: none"> ▪ I know that iteration is the repetition of a process such as a loop ▪ I know that different algorithms exist for the same problem ▪ I can represent solutions using a structured notation ▪ I can identify similarities and differences in situations and can use these to solve problems (pattern recognition)
4	<ul style="list-style-type: none"> ▪ I know a recursive solution to a problem repeatedly applies the same solution to smaller instances of the problem ▪ I know that for some problems I can share the same characteristics and use the same algorithm to solve both (generalisation) ▪ I know the notion of performance for algorithms and I know that some algorithms have different performance characteristics for the same task
5	<ul style="list-style-type: none"> ▪ I know that the design of an algorithm is distinct from its expression in a programming language (which will depend on the programming constructs available) ▪ I can evaluate the effectiveness of algorithms and models for similar problems ▪ I know where information can be filtered out in generalizing problem solutions (abstraction) ▪ I can use logical reasoning to explain how an algorithm works ▪ I can represent algorithms using a structured language

Computer Science Steps – Programming & Development

Step	Competency
1	<ul style="list-style-type: none"> ▪ I can create programs that implement algorithms to achieve given goals ▪ I can declare and assign variables ▪ I can use post tested loops – e.g. until, if and else
2	<ul style="list-style-type: none"> ▪ I know the difference between, and appropriately I can use if and if, then and else statements ▪ I can use variable and relational operators within a loop to govern termination ▪ I can design, write and debug modular programs using procedures ▪ I know that a procedure can be used to hide the detail with sub-solution (procedural abstraction)
3	<ul style="list-style-type: none"> ▪ I know that programming bridges the gap between algorithmic solutions and computers ▪ I have practical experience of a high-level textual language, including using standard libraries when programming ▪ I can use a range of operators and expressions e.g. Boolean, and applies them in the context of program control ▪ I can select the appropriate data types

4	<ul style="list-style-type: none"> ▪ I can use nested selection statements ▪ I know the need for, and can write, custom functions including use of parameters ▪ I can use technologies and online services securely, and I know how to identify and report inappropriate conduct ▪ I know and I can use negation with operators ▪ I can use and manipulate one dimensional data structures ▪ I can find and corrects syntactical errors
5	<ul style="list-style-type: none"> ▪ I know the effect of the scope of a variable e.g. a local variable can't be accessed from outside its function ▪ I know and apply parameter passing ▪ I know the difference between, and I can use, both pre-tested e.g. 'while', and post-tested e.g. 'until' loops ▪ I can apply a modular approach to error detection and correction

Computer Science Steps – Data & Data Presentation

Step	Competency
1	<ul style="list-style-type: none"> ▪ I know the difference between data and information ▪ I know why sorting data in a flat file can improve searching for information ▪ I can use filters or can perform single criteria searches for information
2	<ul style="list-style-type: none"> ▪ I can perform more complex searches for information e.g. using Boolean and relational operators ▪ I can analyse and evaluate data and information, and I know that poor quality data leads to unreliable results, and inaccurate conclusions
3	<ul style="list-style-type: none"> ▪ I know that digital computers use binary to represent all data ▪ I know how bit patterns represent numbers and images ▪ I know that computers transfer data in binary ▪ I know the relationship between binary and file size (uncompressed) ▪ I can define data types: real numbers and Boolean ▪ I can query data on one table using a typical query language
4	<ul style="list-style-type: none"> ▪ I know how numbers, images, sounds and character sets use the same bit patterns ▪ I can perform simple operations using bit patterns e.g. binary addition ▪ I know the relationship between resolution and colour depth, including the effect on file size ▪ I can distinguish between data used in a simple program (a variable) and the storage structure for that data
5	<ul style="list-style-type: none"> ▪ I know the relationship between data representation and data quality ▪ I know the relationship between binary and electrical circuits, including Boolean logic ▪ I know how and why values are data typed in many different languages when manipulated within programs

Computer Science Steps – Hardware & Processing

Step	Competency
1	<ul style="list-style-type: none"> ▪ I know that computer collect data from input devices – sensors, application software ▪ I know the difference between computer hardware and software and what they do
2	<ul style="list-style-type: none"> ▪ I know why and when computers are used ▪ I know the main functions of the operating system ▪ I know the difference between physical, wireless and mobile networks
3	<ul style="list-style-type: none"> ▪ I know the function of the main internal parts of basic computer architecture ▪ I know the concepts behind the fetch-execute cycle ▪ I know that there is a range of operating systems and application software for the same hardware
4	<ul style="list-style-type: none"> ▪ I know the von Neumann architecture in relation to the fetch-execute cycle, including how data is stored in memory ▪ I know the basic function and operation of location addressable memory
5	<ul style="list-style-type: none"> ▪ I know that processors have instruction sets and that these relate to low-level instructions carried out by a computer

Computer Science Steps – Communication and Networks

Step	Competency
1	<ul style="list-style-type: none"> ▪ I know the difference between the internet and the internet service – e.g. protocol ▪ I can show awareness of and use a range of internet services e.g. Skype - VOIP ▪ I know what is acceptable and unacceptable behaviour when using technology and when online
2	<ul style="list-style-type: none"> ▪ I know how to effectively use search engines, and I know how search results are selected ▪ I am able to select, combine and use internet services ▪ I can show responsible use of technologies and online services, and I know a range of ways to report concerns
3	<ul style="list-style-type: none"> ▪ I know how search engines rank search results ▪ I know how to construct static web pages using HTML and CSS ▪ I know data transmission between digital computers over networks, including the internet i.e. IP addresses and packet switching
4	<ul style="list-style-type: none"> ▪ I know names of hardware e.g. hubs, routers, switches, and the names of protocols e.g. SMTP, iMAP, POP, FTP, TCP/IP, associated with networking systems
5	<ul style="list-style-type: none"> ▪ I know the purpose of the hardware and protocols associated with networking computer systems ▪ I know the client-server model including how dynamic web pages use server-side scripting and that web servers process and store data entered by users ▪ I know that persistence of data on the internet requires careful protection of online identity and privacy

Computer Science Steps – Information Technology

Step	Competency
1	<ul style="list-style-type: none"> ▪ I can collect, organise and present data and information as digital content ▪ I can create digital content to achieve a goal and communicate with a wider audience e.g. Blogging ▪ I can make appropriate improvements to solutions based on feedback received and comment on the success of the solution
2	<ul style="list-style-type: none"> ▪ I can make judgements about digital content when evaluating and repurposing it for a given audience ▪ I know the audience when I am designing and creating digital content ▪ I know the potential of information technology for collaboration when computers are networked ▪ I can use criteria to evaluate the quality of solutions and can identify improvements making some refinements to the solution, and future solutions
3	<ul style="list-style-type: none"> ▪ I can evaluate the appropriateness of digital devices, internet services and application software to achieve given goals ▪ I can recognise ethical issues surrounding the application of information technology beyond school ▪ I can design criteria to critically evaluate the quality of solutions; I can use the criteria to identify improvements and can make appropriate refinements to the solution
4	<ul style="list-style-type: none"> ▪ I can justify the choice of and independently combine and I use multiple digital devices, internet services and application software to achieve given goals ▪ I can evaluate the trustworthiness of digital content and consider the usability of visual design features when designing and creating digital artefacts for known audience ▪ I can design criteria for users to evaluate the quality of solutions, and can use the feedback from users to identify improvements and can make appropriate refinements to the solution. ▪ I can identify and explain how the use of technology can impact on society
5	<ul style="list-style-type: none"> ▪ I can undertake creative projects that collect, analyse, and evaluate data to meet the needs of a known user group ▪ I can effectively design and create digital artefacts for a wider or remote audience ▪ I consider the properties of media when importing them into digital artefacts ▪ I can document user feedback, the improvements identified and the refinements made to the solution ▪ I can explain and justify how the use of technology impacts on society, from the perspective of social, economic, political legal, ethical and moral issues