Computer Science - A Journey of Discovery

Essential Skills taught in Computer Science

Listening — Speaking
Problem Solving — Creativity
Staying Positive — Aiming High
Leadership — Teamwork

Year 7

Unit	Unit 0 – Understanding the TGGS Computer System and E-Safety
Detail	Make students aware of the TGGS system and get them to logon to the system, understand how the email works and get them to logon to OneDrive and MS Teams They then study the first E-Safety module from CEOP, looking at the use of social media and looking at the difference between positive and unhealthy attention.
KS3 NC Statement	understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns
Builds on KS2	*use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact*
SMSC	• ability to recognise the difference between right and wrong and to readily apply this understanding in their own lives, recognise legal boundaries and, in so doing, respect the civil and criminal law of England • understanding of the consequences of their behaviour and actions
FBV	an understanding of how citizens can influence decision-making through the democratic process
Sequencing	This is the initial unit for learners, taught early on to allow them to use the system in a sensible and safe way.
Careers	Understanding the role of social media and how it is used in the current workplace.
Essential Skills	Speaking / Listening

Unit	Unit 1 – Computer Crime and Cyber Security
Detail	This unit covers some of the legal safeguards regarding computer use, including overviews of the Computer Misuse Act, Data Protection Act and GDPR and Copyright Law and their implications for computer use. Phishing scams and other email frauds, hacking, "data harvesting" identity theft and safe use of social media are discussed together with ways of protecting online identity and privacy. Health and Safety Law and environmental issues such as the safe disposal of old computers are also discussed.
KS3 NC Statement	understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns
Builds on KS2	*use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact* *use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content*
SMSC	• ability to recognise the difference between right and wrong and to readily apply this understanding in their own lives, recognise legal boundaries and, in so doing, respect the civil and criminal law of England • understanding of the consequences of their behaviour and actions
FBV	an understanding of how citizens can influence decision-making through the democratic process
Sequencing	This unit builds on the work from unit 0, with the development of students knowing how to keep their data safe.
Careers	Legislative careers
Essential Skills	Speaking / Listening

Unit	Unit 2 – Computer Basics
Detail	Students are introduced to the different components that make up a computer system. This builds on knowledge from KS2 and introduces them to the idea of linking computers together in networks, finding out about how computers communicate with one another through developing an understanding of Binary.
KS3 NC Statement	understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal] understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems
Builds on KS2	*understand computer networks, including the internet; how they can provide multiple services, such as the World Wide Web, and the opportunities they offer for communication and collaboration*
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning
FBV	Not directly taught
Sequencing	This unit builds on the understanding that students develop at key stage 2 and then seeks to develop a rudimentary understanding of how computers communicate, which will be further developed in year 9.
Careers	Network Engineers / Hardware Engineers. The development of Problem-Solving skills.
Essential Skills	Speaking / Listening / Problem Solving

Unit	Unit 3 – BlockPy Programming (Baseline Assessment of programming skills)
Detail	Students will have undertaken programming using block-based programming software for example Scratch. They will develop their programming using the BlockPy programming language.
KS3 NC Statement	use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users
Builds on KS2	*design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts* *use sequence, selection, and repetition in programs; work with variables and various forms of input and output*
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning
FBV	Not directly taught
Sequencing	This unit builds on the understanding that students develop at key stage 2, and acts as a baseline assessment so that all students develop and arrive at a common skill level, before they move onto programming with text-based programming languages. Students who show a deeper level of understanding have extension tasks to stretch their learning
Careers	Software Engineers / Game Developers The development of Problem-Solving and Creativity skills.
Essential Skills	Problem Solving / Creativity

Unit	Unit 4 – Flowol (Sequencing Instructions)
Detail	Students will develop their understanding of sequencing sets of instructions and the need to break down computing problems into smaller components. This will be taught using flowcharts through the Flowol programme and will emulate real-life situations in which the students need to solve the problems.
KS3 NC Statement	use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
Builds on KS2	*design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts* *use sequence, selection, and repetition in programs; work with variables and various forms of input and output*
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning
FBV	Not directly taught
Sequencing	This unit develops the students computational thinking skills. With the use of flowcharts they are given progressively more difficult problems that they will need to solve using sequencing, computational thinking and algorithmic thinking.
Careers	Software Engineers The development of Problem-Solving and Creativity skills.
Essential Skills	Problem Solving / Creativity / Aiming High

Year 8

Unit	Unit 5 – Small Basic
Detail	Students will be introduced to a BASIC programming language – they will use MS Small Basic, which will allow them to develop their programming skills in a "text-based" programming language with increasingly more difficult problems to solve.
KS3 NC Statement	use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem
Builds on KS2	*design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts* *use sequence, selection, and repetition in programs; work with variables and various forms of input and output*
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning
FBV	Not directly taught
Sequencing	This unit builds on the previous units (Unit 3 and Unit 4), and the students are introduced to a "text-based" BASIC programming language. The software still scaffolds their programming development, allowing them to tackle increasingly difficult problems that will need the use of modular development in order to provide solutions to the tasks set.
Careers	Software Engineers / Software Developer The development of Problem-Solving and Creativity skills and the use of their skills in developing resilience.
Essential Skills	Problem Solving / Creativity / Aiming High

Unit	Unit 6 – E-Safety and the Law
Detail	The students learn about keeping themselves safe online, looking at how data can be shared and discussing what they need to think about when sharing information online for example the sharing of "nudes".
KS3 NC Statement	understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns
SMSC	• knowledge of, and respect for, different people's faiths, feelings and values • sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning • willingness to reflect on their experiences • understanding of the consequences of their behaviour and actions • interest in investigating and offering reasoned views about moral and ethical issues and ability to understand and appreciate the viewpoints of others on these issues
FBV	an acceptance that people having different beliefs to oneself (or having none) should be accepted and tolerated, and should not be the cause of prejudicial or discriminatory behaviour
Sequencing	This sequence of lessons builds upon the work completed in unit 0 and unit 1. This is taught now as there are "difficult" concepts and material to be studied and this is recognised in the lesson plans.
Careers	This again allows students to appreciate those careers where legislation is discussed and additionally builds on their ability to discuss issues effectively.
Essential Skills	Speaking / Listening / Teamwork / Aiming High / Leadership

Unit	Unit 7 – Artificial Intelligence and Machine Learning
Detail	The students will learn about how computers can be used to make life easier for humans, whilst also developing an understanding of the risks associated with being too reliant on the use of computers.
KS3 NC Statement	understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning • willingness to reflect on their experiences
FBV	an acceptance that people having different beliefs to oneself (or having none) should be accepted and tolerated, and should not be the cause of prejudicial or discriminatory behaviour
Sequencing	This sequence of lessons builds and develops the understanding of the hardware and software components of computer systems, taught in unit 2. They will also be able to critically evaluate the issues than can be caused by an over-reliance on computers.
Careers	Software Engineer / Software Developer / Security Analyst This unit allows students to understand how important it is for teams from different disciplines to work together.
Essential Skills	Speaking / Listening / Teamwork / Leadership / Problem Solving

Unit	Unit 8 – Web-Page Design (HTML)
Detail	The students will now apply their learning to develop a web-page on a subject of their choice, thereby allowing them to develop their creativity. They will combine data from a number of different sources to develop their web-page.
KS3 NC Statement	understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning
FBV	an acceptance that people having different beliefs to oneself (or having none) should be accepted and tolerated, and should not be the cause of prejudicial or discriminatory behaviour
Sequencing	This set of lessons allows students to build on the work from unit 3, allowing them to develop work for an identified audience. They will cover the need for specialist languages (in this case HTML) for specific applications.
Careers	Web Designer / Web Developer The need to combine several Essential Skills
Essential Skills	Problem Solving / Creativity / Teamwork / Aiming High / Leadership

Unit	Unit 9 – Programming with Python
Detail	The students will develop their understanding of programming using text-based programming languages (in this case Python, which is a natural language interface) and tackling computational problems of increasing complexity.
KS3 NC Statement	design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning
FBV	Not directly taught
Sequencing	This set of lessons allows students to build on the work from unit 3, 4, 5 and 8 allowing them to develop work for an identified audience. They will cover the use of non-specialist languages (in this case Python) for general applications.
Careers	Software Engineer / Software Developer / Data Scientist The need to combine several Essential Skills.
Essential Skills	Problem Solving / Creativity / Teamwork / Aiming High / Leadership

Year 9

Unit	Unit 10 – App Development with AppShed
Detail	The students will combine their learning from the previous units that they have studied to make an App that can be used to solve a problem that they have identified.
KS3 NC Statement	understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
SMSC	• knowledge of, and respect for, different people's faiths, feelings and values • sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning • willingness to reflect on their experiences
FBV	an understanding of how citizens can influence decision-making through the democratic process
Sequencing	This set of lessons builds on the work from the previous units in the development of an App to solve a problem for a given audience that they have identified.
Careers	Systems Analyst / Web Developer / Software Engineer / Software Developer Opportunity to work with local businesses. The need to combine several Essential Skills
Essential Skills	Speaking / Listening / Problem Solving / Creativity / Teamwork / Aiming High / Leadership

Unit	Unit 11 – Handling Data on Computers
Detail	The students learn about how data and memory is used in computers, converting between different numbering systems (denary / binary / hexadecimal). They also learn about how searches and sorts can be used on data and finally they see how this can be applied in order to store sound and images effectively.
KS3 NC Statement	understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem. understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal]. understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems. understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits.
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning • willingness to reflect on their experiences
FBV	Not directly taught
Sequencing	This sequence of lessons builds upon the work completed in unit 2 in year 7 and allows students to understand more clearly why issues such as overflow errors occur – that even computer systems have limitations.
Careers	Software Analyst / Software Engineer / Systems Analyst / Network Engineer. This unit allows a number of Essential Skills to be tackled
Essential Skills	Listening / Problem Solving / Creativity / Staying Positive / Aiming High

Unit	Unit 12 – Turing Tumble (Developing Logical Operations)
Detail	The students learn about how logical operations are undertaken on computers. This is done through a game (Turing Tumble) and is introduced as a self-paced unit that will allow the students to develop their understanding from unit 11 and to appreciate how AND, OR and NOT logic gates work in reality.
KS3 NC Statement	understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem. understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal]. understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems.
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning • willingness to reflect on their experiences
FBV	Not directly taught
Sequencing	This sequence of lessons builds upon the work completed in unit 2 (from year 7) and unit 11 – this practical understanding of how logic gates operate.
Careers	Software Analyst / Software Engineer / Systems Analyst / Network Engineer. This unit allows a number of Essential Skills to be tackled
Essential Skills	Listening / Problem Solving / Creativity / Staying Positive / Aiming High

Unit	Unit 13 – Girls Who Code (Advanced Python)
Detail	The students undertake a number of Python coding challenges, that build upon earlier programming work. These tasks have been deigned to engage girls in programming and they get progressively more challenging as they progress through the unit.
KS3 NC Statement	design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems. understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem. use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions.
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning • willingness to reflect on their experiences
FBV	Respecting the values, ideas and beliefs of others whilst not imposing our own others.
Sequencing	This sequence of lessons builds upon the work completed in unit 3, unit 5 and unit 9. It is designed to give students increasingly more complex problems to solve and to develop their confidence in tackling programming problems.
Careers	Software Analyst / Software Engineer / Systems Analyst This unit allows a number of Essential Skills to be tackled
Essential Skills	Listening / Problem Solving / Creativity / Staying Positive / Aiming High

Unit	Unit 14 – Online Safety and Data Security
Detail	The students identify and discuss the various threats that there are for data security and develop how their digital footprint is arrived at. They develop a sound understanding of the various methods that can be used for keeping data safe online.
KS3 NC Statement	design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems. understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem. design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems. understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns.
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning • willingness to reflect on their experiences
FBV	Respecting the values, ideas and beliefs of others whilst not imposing our own others.
Sequencing	This sequence of lessons builds upon the work completed in unit 0, unit 1 and unit 6. The students apply their knowledge from the course to this point to allow them to assess the risks to their online security and to prepare them for using data from another outside source in unit 15.
Careers	Software Analyst / Software Engineer / Systems Analyst /Cyber Security Specialist This unit allows a number of Essential Skills to be tackled
Essential Skills	Listening / Problem Solving / Creativity / Staying Positive / Aiming High

Unit	Unit 15 – Mars Insight (Applied Programming and Data Modelling)
Detail	The students are given a problem to solve (which is to create a game that is suitable for younger ages students aged 8 to 11), where they will need to choose the software and undertake the complete Analyse – Design – Implement – Test – Evaluate cycle (ADITE). They then complete the course by analysing data from the Mars InSight mission.
KS3 NC Statement	design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems. understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem. use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions. undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users. create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability.
SMSC	• sense of enjoyment and fascination in learning about themselves, others and the world around them • use of imagination and creativity in their learning • willingness to reflect on their experiences
FBV	Respecting the values, ideas and beliefs of others whilst not imposing our own others.
Sequencing	This sequence of lessons is intended to allow the students a degree of freedom, choosing the most suitable software and independently developing the criteria for the project.
Careers	Software Analyst / Software Engineer / Systems Analyst This unit allows a number of Essential Skills to be tackled
Essential Skills	Listening / Problem Solving / Creativity / Staying Positive / Aiming High / Teamwork / Leadership

GCSE Computer Science

Course component	Course component
THEME 1 – HARDWARE 1.1 Architecture 1.2 Input / Output 1.3 Storage 1.4 Additional Components 1.5 Embedded Systems	**THEME 5 – OPERATING SYSTEMS** 5.1 Managing Resources 5.2 Interfaces 5.3 Utility Software
THEME A - PROBLEM SOLVING 2.2.1 Working Systematically 2.2.2 Abstraction	**THEME 6 - PRINCIPLES OF PROGRAMMING** 6.1 Levels of Computer Language
THEME 2 - LOGICAL OPERATIONS 2.1 Logical Operators 2.2 Boolean Logic	**THEME 7 - SOFTWARE ENGINEERING** 7.1 Software Tools
THEME B - ALGORITHMS AND PROGRAMMING CONSTRUCTS 2.2.3 Algorithms 2.2.4 Programming Constructs 2.2.5 Handling Data 2.2.6 Sorting / Searching 2.2.7 Testing and Evaluation	**THEME D - PYTHON PROGRAMMING** 2.2.8 Project Work and Practical Examination Preparation
THEME C - PYTHON PROGRAMMING 3.3.1 Skills Development	**THEME E - SECURITY AND AUTHENTICATION** 2.2.9 Security Techniques
THEME 3 - COMMUNICATION 3.1 Networks 3.2 Internet	**THEME 8 – PROGRAM CONSTRUCTION** 8.1 Compilers, Interpreters and Assemblers
THEME 4 - ORGANISATION AND STRUCTURE OF DATA 4.1 Representation of Numbers 4.2 Representation of Graphics and Sound 4.3 Storage of Characters 4.4 Data Types 4.5 Data Structures 4.6 File Design 4.7 Data Verification and Validation	**THEME 9 – SECURITY AND DATA MANAGEMENT** 9.1 Data Security 9.2 Data Management 9.3 Compression 9.4 Network Security 9.5 Cybersecurity **THEME 10 - ETHICAL, LEGAL AND ENVIRONMENTAL IMPACTS OF DIGITAL TECHNOLOGY ON WIDER SOCIETY** 10.1 Ethical 10.2 Legislation 10. 3 Environmental Issues

A level Computer Science

Course component	Description
Component 1 - Programming and System Development	This component investigates programs, data structures, algorithms, logic, programming methodologies and the impact of computer science on society
Component 2 - Computer Architecture, Data, Communication and Applications	This component investigates computer architecture, communication, data representation, organisation and structure of data, programs, algorithms and software applications.
Component 3 – Programmed Solution to a Problem	Candidates discuss, investigate, design, prototype, refine and implement, test and evaluate a computerised solution to a problem chosen by the candidate which must be solved using original code (programming).