**Curriculum Intent**

*"Computers are great because when you're working with them you get immediate results that let you know if your program works. It's feedback you don't get from many other things."* - Bill Gates

The Computing Department intends to equip all students to use computational thinking and creativity when understanding the modern world. Computing is a large part of society and we aim to teach our students to be responsible, knowledgeable innovators of digital systems and technology.

The digital sector is a dynamic, growing and rewarding sector to work in, with new opportunities arising continually. We focus on providing learners the opportunity to gain sector specific knowledge and skills in a practical environment. We aim to prepare our students to compete in a global economy, whilst taking into account the improving local economy and labour market.

We enable students to understand concepts such as sequencing, selection and iteration. We provide students the opportunity to put theory into practice allowing them to grow as problem solvers. Our students learn skills across the Computer Science, Information Technology and Creative Media sectors, while constantly improving their digital literacy skills to preparing them for the workplace.

Our Computing curriculum is challenging and aspirational. We also recognise the wide range of abilities and learning styles at St Cuthbert's and endeavour to meet the needs of each child.


**Teaching and Learning**

Students have the right to rich, deep learning experiences that balance all the aspects of Computing.
With technology playing such a significant role in society today, we believe 'Computational Thinking' (problem solving, analysing and evaluating) is a skill all students must be taught if they are to be able to participate effectively and safely in this digital world.

Students experience an hour a week of computing in each year group at KS3, this allows them sufficient time to become fluent in their knowledge and skills, and recalls will ensure this is embedded in their long-term memory. Each lesson leads in supporting students to acquire knowledge, through the use of concepts, terms and vocabulary, providing opportunities to build a shared and consistent understanding.

This enables them to become effective users of technology who understand and apply the essential principles and concepts of Computer Science, communicate ideas well by utilising appliances and devices throughout all areas of the curriculum.

Our Computing curriculum teaches and encourages students to work as part of a team to solve, analyse and evaluate problems. A major component of our Computing curriculum is Digital Literacy, in which students learn how to use technology responsibly and safely. We also believe that deep links with other subjects and real-life experiences are essential and therefore our Computing curriculum has links with English, Mathematics, Science, and Design and Technology.

Some learning will follow through from the previous year where this was not covered in depth. Opportunities will be sought to cover these areas within the existing units detailed below. This will ensure that future learning is not negatively impacted and that the existing curriculum is covered within the time frame of the school calendar. Interleaving strategies will also be used through 'Review of Learning' activities.

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**Assessment opportunities**

Each unit will begin by ascertaining the children's prior knowledge and any connected knowledge held in their long term memory. Further recalls take place approximately six weeks and then twelve weeks later in order to ensure that the knowledge is embedded in the Students' long term memory. Children continue to recall their knowledge throughout each unit via low stakes testing or a review of learning activity at the beginning of the lesson. Any misconceptions that arise within the unit are identified and addressed appropriately. Feedback is given every 2 to 3 weeks via class feedback sheets. Students are given the opportunity to respond to the feedback (MIB) in lesson. Feedback is also given verbally to students in order to support them to progress within and across lessons.

An integral part of computing is fostering the students' ability to develop digital content in a creative way. Programs are created on digital devices and as such are not recorded in the same way as written learning.
Learning may be recorded in many ways including but not limited to: printed screenshots of creations, saved programs, PowerPoints, word documents, written work, photographs and video recordings.

Formative assessment takes place at the end of each unit. Students are given the opportunity to improve the KAT following teacher feedback. There is also a summative KAT at the end of each half-term.

All learning outcomes can be described through a high-level taxonomy of ten strands, ordered alphabetically as follows:

- Algorithms
- Computer networks
- Computer systems
- Creating media
- Data and information
- Design and development
- Effective use of tools
- Impact of technology
- Programming
- Safety and security

The taxonomy provides categories and an organised view of content to encapsulate the discipline of computing. Whilst all strands are present at all phases, they are not always taught explicitly.

**Teaching and Learning sequence**

This is a new curriculum and developed by computing professionals as part of the government supported NCCE/STEM program. These units fit nicely with the Oak Academy videos and this continues to support our blended learning programme.

Online Safety will be **mentioned throughout the year in each year. Students will recap and recall previous subject knowledge** throughout the year wherever possible to remind students how to use technology safely, respectfully, responsibly and securely. This prepares our students as they progress through a range of topics in the classroom while ensuring they have the **knowledge to protect themselves** online and know how to report concerns.

**Year 7 Curriculum**

**Reason for teaching sequence:**

**Term 1A** – *Collaborating online respectfully.* E-safety is the first unit taught in year 7 as in line with the national curriculum it is important that all students are aware of the health and safety issues and online dangers associated with the use of computers enabling them to use computers responsibly. Understanding the copyright, designs and patents act is also a topic we want our students to understand and make link with future units that include the use of digital content.  By the end of the unit, they should be able to use the school network safely and respectfully. This unit has been designed to ensure that learners are given sufficient time to familiarise themselves with the school network. It also allows the teacher to discuss appropriate use of the school network, and to update and remind learners of important online safety issues. Whilst completing this unit, learners will also learn how to use presentation software effectively. In terms of online safety, this unit focuses on respecting others online, spotting strangers, and the effects of cyberbullying.

**Term 1B** – *Networks*: from semaphores to the Internet: This unit builds on issues of privacy and security introduced in term 1A. We also develop a deeper understanding of how we communicate using network technology. This unit links with future units in Year 8 and 9 – Computing Systems and Cyber Security. This unit begins by defining a network and addressing the benefits of networking, before covering how data is transmitted across networks using protocols. The types of hardware required are explained, as is wired and wireless data transmission. Learners will develop an understanding of the terms 'internet' and 'World Wide Web', and of the key services and protocols used. Practical exercises are included throughout to help strengthen understanding.

**Term 2A** - *Using media* – Gaining support for a cause: This unit builds on digital literacy skills developed in previous units, most noticeably in Term 1A. They will develop a deeper understanding of information technology and digital literacy by using their skills across the unit to create a blog post about a real world cause that they are passionate about and would like to gain support for. This also has links with future units and with the Creative Media BTEC course.

**Term 2B** – *Programming 1*: This unit is the first programming unit of KS3. It is important to start to embed some of the programming skills and knowledge early at KS3. We have chosen to continue with this into term 3A as we believe that programming needs the time to allow children to create and experiment with their programs. The aim of this unit and the following unit (Programming II) is to build learners' confidence and knowledge of the key programming constructs. Importantly, this unit does not assume any previous programming experience, but it does offer learners the opportunity to expand on their knowledge throughout the unit. The main programming concepts covered in this unit are sequencing, variables, selection, and count-controlled iteration. All of the examples and activities for this unit use Scratch 3.

**Term 3A** – *Programming 2*: This unit begins right where 'Programming I' left off. Learners will build on their understanding of the control structures' sequence, selection, and iteration (the big three), and develop their problem-solving skills. Learners will learn how to create their own subroutines, develop their understanding of decomposition, learn how to create and use lists, and build upon their problem-solving skills by working through a larger project at the end of the unit.

**Term 3B** – *Spreadsheets:* We have chosen this to be our last unit of the year as we like to have a mixture of theory and practical based topics throughout the year. This helps to keep learners engaged. It takes learners from having very little knowledge of spreadsheets to being able to confidently model data with a spreadsheet. The unit uses

engaging activities to progress learners from using basic formulas to writing their own COUNTIF statements. This unit will give learners a good set of skills that they can use in computing lessons and in other subject areas. This unit progresses learners' knowledge and understanding of modelling data using a spreadsheet.

**Year 8 Curriculum**

**Reason for teaching sequence:**

**Term 1A** – *Developing for the web:* We have chosen to include this unit here to progress from the Scratch programming units in Year 7 and as a bridge towards text-based programming in Year 9. In this unit, learners will explore the technologies that make up the internet and World Wide Web. Starting with an exploration of the building blocks of the World Wide Web, HTML, and CSS, learners will investigate how websites are catalogued and organised for effective retrieval using search engines. By the end of the unit, learners will have a functioning website.

**Term 1B** – *Representations from clay to silicon:* The concepts in this unit are linked to practical applications and problems that the learners are familiar with such as that in programming topics. This unit conveys essential knowledge relating to binary representations. The activities gradually introduce learners to binary digits and how they can be used to represent text and numbers.

**Term 2A** – *Mobile app development:* In a world where there's an app for every possible need, this unit aims to take the learners from designer to project manager to developer in order to create their own mobile app. Using App Lab from code.org, learners will familiarise themselves with the coding environment and have an opportunity to build on the programming concepts they used in previous units before undertaking their project. Learners will work in pairs to consider the needs of the user; decompose the project into smaller, more manageable parts; use the pair programming approach to develop their abilities to collaborate.

**Term 2B** – *Media Vector Graphics:* In this unit we introduce media skills that will become vital if students chose BTEC Creative Media as one of their option choices. Vector graphics can be used to design anything from logos and icons to posters, board games, and complex illustrations. Through this unit, students will be able to better understand the processes involved in creating such graphics and will be provided with the knowledge and tools to create their own. This unit is placed here to offer variety in the curriculum in between units that are geared towards GCSE Computer Science.

**Term 3A** – *Computing Systems:* This unit builds on some knowledge gained in Year 7 Networking. It is important that students start to develop an understanding of the fundamentals of how computers work before they are introduced to more challenging concepts delivered later in the year and in Year 9. The aim is to provide a concise overview of how computing systems operate, conveying the essentials and abstracting away the technical details that might confuse or put off learners. The last lessons cover two interesting contemporary topics: artificial intelligence and open source software. These are linked back to the content of the unit, helping learners to both broaden their knowledge and focus on the topics addressed in the unit. The unit assumes no prior knowledge. There are, however, links to the 'Representation' unit in term 1B and the 'Networks' units delivered in Years 7.

**Term 3B** – *3D Modelling – Grand Designs:* This unit builds on previous digital literacy skills and aims to teach learners how to plan and carry out a project while applying a variety of IT skills, such as 3D modelling, spreadsheet modelling and presentation skills. Learners will plan their project by using a Gantt chart, design a house using Google SketchUp,

calculate the expenditures of the project using Excel then produce a presentation to explain why their house should be built. The topic finishes with an evaluation of the work produced.

**Year 9 Curriculum**

**Reason for teaching sequence:**

**Team 1A** - *Introduction to Python programming:* We now start to build on block coding units delivered in Year 7 and 8. We have only included this here as students will have a foundation to push onto the more challenging text-based programming. The lesson starts with simple programs involving input and output, and gradually moves on through arithmetic operations, randomness, selection, and iteration. Emphasis is placed on tackling common misconceptions and elucidating the mechanics of program execution. A range of pedagogical tools is employed throughout the unit, with the most prominent being pair programming, live coding, and worked examples. This unit will prepare students for the more challenging programming units at GCSE Computer Science.

**Term 1B** – *Media Animations:* This builds on the 'Media Vector Graphics' unit in Year 9. This practical unit provides variation in the curriculum and gives students an understanding of some of the content delivered in the BTEC Creative Media qualification at Key Stage 4. In this unit learners will discover how professionals create 3D animations. By completing this unit learners will gain a greater understanding of how this important creative field is used to make the media products that we consume. Sessions will take learners through the basics of modelling, texturing, and animating; outputs will include 3D models, short videos, and VR. Links are made throughout to computer science, computational thinking, and the world of work. Tools and techniques learnt in this unit can also be used for 3D printing.

**Term 2A** – *Data Science:* In this unit, learners will be introduced to data science, and by the end of the unit they will be empowered by knowing how to use data to investigate problems and make changes to the world around them. Learners will be exposed to both global and local data sets and gain an understanding of how visualising data can help with the process of identifying patterns and trends. Towards the end of the unit, the learners will go through the steps of the investigative cycle to try to solve a problem in the school using data.

**Term 2B** – *Multi-media video editing:* In this unit learners will develop their understanding of how media products create meaning for an audience. They will examine existing products and explore media production techniques and understand the power of media products in being able to enthral, intrigue and affect people's lives. The practical element of this topic will be to create an advert for a target audience and learners will develop skills and understanding of editing and production techniques. At the end of this unit learners will have an understanding of media practitioners' work, techniques and technology, which are used to contribute to the creation of media products. They will develop transferable skills, such as analysis and communication, which will help them to progress in Computing and other areas of the curriculum.

**Term 3A** – *Cybersecurity:* This unit builds upon issues of privacy and security from the online safety and networking units. We have chosen to put this here as we believe that students should now begin to develop a greater understanding of the threats and dangers in an online world. This unit takes learners on a journey of discovery of techniques that cybercriminals use to steal data, disrupt systems, and infiltrate networks. The learners will start by considering the value their data holds and what organisations might use it for. They will then learn about social engineering and other common cybercrimes, and finally look at methods to protect against these attacks.

**Term 3B –** *Physical computing:* This unit applies and enhances the learners' programming skills in a new engaging context: physical computing, using the BBC micro:bit. In the first half of the unit, learners will get acquainted with the host of components built into the micro:bit, and write simple programs that use these components to interact with the physical world. In the process, they will refresh their Python programming skills and encounter a range of programming patterns that arise frequently in physical computing applications.

In the second half, learners will work in pairs to build a physical computing project. They will be required to select and design their project purposefully, apply what they have learnt by building a prototype, and keep a structured diary throughout the process.

The Year 8 and 9 programming units are prerequisites for this unit. It is assumed that learners are already able to write Python programs that use variables and data structures to keep track of information. They are also expected to be able to combine sequence, selection, iteration, and function/method calls to control the flow of program execution.

**KS4 Creative Media Teaching Sequence:**

**Year 10**

Responding to a given brief is the next **skill taught in year** 10. We have chosen to develop our student's skills in understanding what a company/client may ask them to develop and eventually create within a digital media sector. This also prepares students understanding of the type of questions that will be asked of them by the exam board in their Pre-release material. A huge emphasis will be placed on subject specific terminology which is required throughout the course-work. **Students will understand the importance of designing with an end user in mind by recapping and knowledge recall from KS3.**

Following on from this the next stage in the sequence will support students in beginning to generate ideas, enabling them to showcase their creative skills and individualism of digital media. **This is a natural progression from the Ks3 study of a life cycle and has links to work from Design Technology**. Students will learn how to plan a product from beginning to end in more detail, researching pre-production, production, post pro-production techniques and understand distribution in a digital age. They will review their target audience, develop a profile for them and gather a rounder understanding of why media is made with a primary audience in mind. **This sequence will be built upon from previous learning in Yr.9 SOL**. Students will look at how an audience's demographics, social class, cultural beliefs, age and gender influence the media they consume and what platforms they consume it on. This will present a clearer **vision of the bigger picture** and how and why we perform the task in this sequence.

The next task in the **sequence** is for students to use the data they have gathered previously to combine and research on 3 media sectors. This will be the beginning of their Component 1 BTEC course-work. This will continue until June when students will hand it in for feedback and a predicted grade. **This will be a big write task.**

During the exam week the student will look at a previous pre-release assessment and will attempt a reduced timed practical to give them a feel for the language used and the technical detail that will be required of them next year. **They will be taught techniques to support them in recalling and recapping previous learning. This will be a big write task.**

Students will MIB work from exam week and Component 1. Lessons will be taught for the following 2 weeks on any misconceptions brought up from the marking of the pre-release and Component 1. Students will have 2 weeks to make any necessary MIB before the hand in date for Component 1.

The final term will be given over to the introduction of Component 2. Students will have the time to complete any independent research and reading that they will require to undertake this task. They will be able to select software packages that they feel would be beneficial to them and spend time developing their technical and creative skills. This task will support student in preparing for the next academic year. **They will make links to cultural capital and how what they are producing could be used in the outside world.**

**Year 11**

Students will be informed of the plan of action **(bigger picture)** for the year and the controlled exam will be mentioned along with the skills we will continue to develop throughout the year. Subject terminology and its importance in every lesson will be **recapped and reviewed continually.**

Term 1a lessons will be to ensure students' knowledge and technical skills are strong in all areas of software from Publishing to Audio/photography/filming and gaming. **This will be recalling on past learning and promoting knowledge recall. This sequence is necessary as student to compound their technical skills** before their controlled assessment in February.

Storyboards will be the next area that the students will work on. **The sequence is linked to component 3 and will include some elements of knowledge recall along with new learning**. The emphasis will be on communication using illustrations, text and colour. Annotation and getting your message across to your target audience will be taught alongside this topic

In term 1b students will plan what media sector they wish to use for Component 3 and work on the creation of a given document taken from a previous Pre-release. **Again, this is knowledge recall from previous learning in Yr.10 along with further skills building using their chosen software**. **The sequence is set this way due to time management in accordance to their Pre-release so that the topic is fresh in their mind.**

The focus of term 2a will be on report writing. Students will be given a selection of briefs and will write a report of how they will meet the needs of the audience in developing the product. Lesson will be taught to support the student and model what good looks like. **The sequence is set this way due to time management in accordance to their Pre-release so that the topic is fresh in their mind. Big Write**

Tem 2b will be the introduction of the Pre-release set by the exam board. Students will be given 2 weeks to plan, research and gather information that will support them in the creation and development of this component. The Pre-release will be broken down into chunks and will take the student to Easter. **Big Write**

The final term will be given over to MIB of Component 2 before moderation.

**Curriculum Computer Science**

**Year 10**

Students will learn a combination of concepts, skills and knowledge. Programming topics are interleaved with theoretical topics. This approach aids retrieval as well as offering variety.

The extensive programming unit takes learners from being complete novices to having the confidence to tackle any GCSE-level programming challenge. Essential programming theory is also interleaved into the practical elements of programming to provide tangible links between required knowledge and skills.

The latest pedagogical research has been used to ensure that learners are appropriately 'scaffolded' and challenged as they move through the lessons. This builds on previous activities with a text-based language in Year 8 and 9, and should help most learners advance through the earlier lessons at a faster rate than planned. Challenge tasks have been provided to help stretch learners that need a further challenge.

An overview of the **programming topics** and their sequencing is shown below.

| Term 1A | Term 1B | Term 2A | Term 2B | Term 3A | Term 3B |
|---------|---------|---------|---------|---------|---------|
| Translators Sequence Variables Input Flowcharts Randomisation | Selection Nested selection Logical expressions While & For loops Trace tables | Pseudocode Subroutines Functions Scope | XOR Structured programming GUIs Create a program | String handling Arrays and lists | 2D Lists |

**Term 1A -** *Data Representations:* This unit allows learners to gain the understanding and skills required for the data representation sections of the GCSE computer science exam. First, learners look at binary and hexadecimal numbering systems, how they work, and how to convert between bases. Then, learners explore different coding systems and find out how text, images, and sound are represented in computers. All lessons include worksheets to allow learners to explore each topic through practical application. This unit links with the data representation and computing systems units in Year 8.

**Term 1B –** *Computer Systems:* In this unit, learners will gain an understanding and knowledge of how computer systems work. Starting with the building blocks of the microprocessor — logic gates — learners will discover how a computer system works and executes instructions. Students have prior knowledge of the binary number system from term 1A and at KS3. Programming topics are interleaved with the theoretical units and this will help to give some practical context.

**Term 2A –** *Algorithms:* The main focus of this unit is on searching and sorting algorithms, though other topics are covered, such as computational thinking, flow charts, and tracing algorithms. Learners will have opportunities to analyse, interpret, modify, and implement a range of algorithms. There are many crossovers with the KS4 Programming unit. The order of this will be in line with the order of the programming topics. For instance, the lessons that involve tracing code, coding linear search and binary search and coding bubble sort and insertion sort require learners to be familiar with programming concepts such as selection, iteration, and lists.

**Term 2B –** *Networks:* This unit guides learners to gain an understanding of computer networks as required for GCSE Computer Science. It starts by defining what networks are and where we find them in our modern world. Then,

learners look at the hardware involved in creating networks. In this unit, students will use Raspberry Pi computers to create a network and demonstrate to learners how data is shared across networks. The content links with 'networks' in Year 7.

**Term 3A** – *Cyber Security:* This unit enables students to gain knowledge and understanding of the range of cybersecurity threats impacting the world, our organisations, as well as us as individuals. Learners will explore security measures that can be put in place to protect networks and your data against different forms of automated and non-automated forms of attack. Once they have understood the impact of cybercrime, they will be inspired to be part of the solution, when they learn about the potential for lucrative and fulfilling careers in cybersecurity. This builds on the previous networks unit where network security is considered as well as the 'cyber security' unit in Year 9.

**Term 3B** – *HTML:* Students have prior basic knowledge of HTML and how the internet works from KS3 units. There are also links with the networks unit in term 2B. In this unit students will gain an understanding of how websites are displayed within a browser using HTML and CSS. Starting with an introduction to how websites are requested and delivered to our computer via the internet and the World Wide Web, students will go on to study how to create the structure of a website using HTML and change the styling using CSS. This unit covers multiple aspects of the National Curriculum Computing programmes of study.

**Year 11**

Programming: -

| Term 1A | Term 1B |
|---|---|
| Records and dictionaries Reading and writing to text files Working with and writing to CSV files | Good habits of a programmer Appending to a CSV Designing and writing for a project – independent practice. |

**Term 1A** – *Impacts of Technology:* This unit has been designed to enable GCSE students to gain knowledge and understanding of the impact of technology on individuals, organisations, and the planet. Through a range of real-world examples, they will learn how to identify the specific type of impact, ie legal, cultural, privacy, environmental, and ethical. They will then progress to identifying stakeholders who are impacted by technology, and learn how these impacts are experienced, negated, or adapted to. Throughout the unit, learners will be encouraged to discuss their views and make use of sample long-form answers as either cloze or comprehension exercises, to further develop their rhetorical skills. Lastly, they will complete an assessment and identify which of the technologies that they have studied they believe to have had the most negative or positive effect on our society as a whole.

**Term 1B** – *Programming project (see table above):* The culmination of all of the previous programming concepts, skills and knowledge.

**Term 2A** – *Databases and SQL:* This unit introduces learners to the world of databases and SQL. Learners explore the key terms used in a database and learn why relational databases are used to eliminate the redundancy and

inconsistencies that can occur in a flat file database. Next, they explore increasingly challenging SQL commands where they retrieve, update, and delete data in a relational database.

**Term 3A –** *Revision*: A series of revision activities to prepare for the external exam.