Curriculum Overview – Computing & ICT

Howden School

THE CONSORTIUM ACADEMY TRUST

Shaping Positive Futures

Introduction

This document outlines the curriculum and key considerations including:

- Aims and purpose
- Alignment with the whole school provision and curriculum intent
- A summary programme of study which includes sequencing of taught content

We use the National Curriculum as our statutory foundation and broadly share its principles and aims including:

- 'To provide pupils with an introduction to the essential knowledge that they need to be educated citizens. To introduce pupils to the best that has been thought and said; and help engender an appreciation of human creativity and achievement'.
- To prepare students to be confident in themselves, to have a fulfilled and successful life beyond our school – one where they contribute positively to society.
- Our statutory curriculum is just one element in the education of every child. There is time and space in the school day and in each week, term and year to range beyond statutory specifications.
- Provision of a framework of core knowledge around which teachers can develop exciting and stimulating lessons to promote the development of pupils' knowledge, understanding and skills as part of the wider school curriculum.
- The wider school curriculum includes an extensive range of opportunities and activities that are routinely available to students, are inclusive and reflect our diverse community.

Numeracy and literacy

Teachers should take opportunities to develop pupils' mathematical fluency, spoken language, reading, writing and vocabulary within their specific discipline and in line with the expectations laid out in our school curriculum statement.

Purpose of study

'A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.' Adapted from National Curriculum, DfE, 2014.

Curriculum Aims

The Howden School curriculum for computing and ICT aims to ensure that all pupils:

- promote the safe use of computers and develop lifelong computer skills.
- can understand and apply the fundamental principles and concepts of computer science, including logic, algorithms and data representation
- can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- are responsible, competent, confident and creative users of information and communication technology.

Building on prior learning

By the end of Key Stage 2, pupils should have been taught to:

- 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
- use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs
- 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
- use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content
- select, use, and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating, and presenting data and information
- use technology safely, respectfully, and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact

What are the skills gaps?

Generally, pupils from feeder primary schools are familiar with using some programmes from Microsoft Office, particularly Word and PowerPoint. Typically keyboard skills increasingly becoming a weakness due to use smart devices with touchscreens – this leads to some pupils lacking facility with keyboards and basic computer skills. Although the primary curriculum covers coding, this is not always taught consistently across all schools due to limitations on resources in some feeder primary schools, so some pupils do not have an awareness or knowledge of basic coding concepts and skills.

Curriculum Structure

Disciplinary Knowledge Strands	Year 7	Year 8	Year 9	Year 10	Year 11
E Safety	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.	Safe use of the internet, protecting their online identity and understanding the needs for privacy settings	Recap of fundamentals of online safety. Links to PSHCE with specific topics, such as risks of radicalisation and extremism through online platforms.	Learn about the different types of cyber security and protection of data. Understand the dangers of malware and social engineering	Understand computer networks and network security.
Creation and Programming	Exploring programming with a focus on block coding and flow charts to gain a fundamental understanding of the key programming concepts of sequencing, iteration and selection	Follow a 12-week block of textualized programming using Python. Developing understanding and facility with the three key aspects of programming - sequencing, iteration and selection	Use Python to solve a variety of computational problems including making 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	Application of the skills learned across the programming strand to create high-level programmes in response to a wide variety of challenges.
Algorithmic Thinking	Explore what an algorithm is and how algorithms are used in our daily lives	Explore how computers use algorithms to sort and search data. Use logical reasoning to compare the utility of alternative algorithms for the same problem		Understand what algorithms are, what they are used for and how they work in relation to creating programs	Develop the ability to follow, amend and write algorithms; ability to construct truth tables.
Problem Solving	Use Flowol to generate solutions to real life problems such as traffic management	Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical	Work out why programmes might not work and debug their own programmes.	Utilise skills developed across KS3 to plan and design a digital artefact in response to specific scenario/brief.	Use both abstraction and computational thinking to extract the information required to respond

		systems, using python and robotics			appropriately to questioning.
Computing Fundamentals	Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems	Advance their knowledge of computing fundamentals to create websites and logos.	Study Microsoft Excel in detail and look at the key concepts required for lifelong competency using computers in different contexts.	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	have an awareness of emerging trends in computing technologies, and the impact of computing on individuals, society and the environment, including ethical, legal and ownership issues.

Key subject skills - BTEC Digital Information Technology

AO1	AO2	AO3	AO4
Demonstrate knowledge of facts, terms, processes, and issues in relation to digital information technology	Demonstrate an understanding of facts, terms, processes, and issues in relation to digital information technology	Apply an understanding of facts, terms, processes and issues in relation to digital information technology	Make connections with the concepts, issues, terms and processes in digital information technology

Curriculum Sequencing

Key Stage 3: Year 7 – Long Term Planning

	Autumn term	Spring term	Summer term
Knowledge	**Introduction to ICT** • ART & AMT TESTING • Using the Computer • Folder structure • Dangers in the computer room **Kodu Gaming** • Setting up a world • Creating & controlling characters • Character interaction	**Binary** • What is Binary • Binary & Denary conversions • Binary Addition • Encoding Images **Flowol** • Introduction to Flowcharts • Simple Outputs • Decision (IF – ELSE)	**Python Turtle** • Simple Sequences • Iteration • Complex Sequences • Subroutines • Creating Images **E-Safety** • Social Networking • Privacy Settings

	• Creating a game with purpose • Multi – Level games • Coding challenges	• Advanced Decisions • Complex Scenarios	• Keeping data safe • Using email • Searching the web
Vocabulary And Key Terms	File Management Network Cabling Interaction	Binary Denary Overflow Errors Binary Shift Decision Output Efficiency Iteration	Python Shell Syntax Logic error Loops Cookies HTTPS Padlock
Assessment	**Introduction to ICT** Mid Term assessment (3) • Folder Structure presented for both Year 7 and Year 8 End of unit assessment (6) • PowerPoint created highlighting the dangers in a computer room **Kodu GameLab** End of unit assessment (6) • Students design a world with purpose that allows the user to play and potentially win	**Binary** End of Unit assessment (6) • Students given a range of questions on paper asking them to demonstrate conversions, addition and encoding images **Flowol** End of unit assessment (6) • Students tasked with creating flowcharts for a range of mimics from the Flowol software that challenge the full range of skills	**Python Turtle** End of Unit assessment (6) • Students create an image of their choice using the skills they have learnt over the unit **E-Safety** End of unit assessment (6) • Students create a PowerPoint on the dangers they could face using the internet and how to mitigate this

Key Stage 3: Year 8 – Long Term Planning

	Autumn term	Spring term	Summer term
Knowledge	**Revisiting the basics** • Folder Structure • Sequence • Selection • Iteration **Algorithms**	**Python Programming** • Introduction to textualized programming • Sequence & Inputs • Selection • Chatbot (Siri) • Iteration • Game Design	**Websites** • Pioneers of Computing • Safe Internet Searching • House Styles • Master Slides • Advanced Skills

	• Computational Thinking • Simple Algorithms • Flowol Link and Recap • Sorting Algorithms • Searching Algorithms	• Random Numbers • Caeser Ciphers	**Robotics** • Robots in the real world • Movement • Robots at work • Concept Robots • Robot Wars • Creating Flowcharts
Vocabulary And Key Terms	Algorithm Unambiguous Midpoint Linear	Variables Constants Data types Casting Concatenation Iteration IDLE	House Style Master slide Concept
Assessment	**Algorithms** End of unit assessment (6) • Students required to answer a series of questions on the different types of algorithms studied	Midterm assessment week 5 • Create a chatbot with reference to Siri that can converse and learn knowledge about a user End of unit assessment week 12 • Creating programmes from a selection related to their technical ability.	**Websites** End of unit assessment (6) • Students create a website on the pioneers of computing demonstrating the skills needed for a professional website **Robotics** End of unit assessment (6) • Students create a robot to solve a specific problem. They must then create the flowcharts needed to control it

Key Stage 3: Year 9 – Long Term Planning

In year 9, ICT is taught on a 12-week rotation alongside technology.

Knowledge	**Computer Systems** • The CPU • Main Memory • Secondary Storage **Logic Gates** **Networks**

	• Introduction to Networks • Hardware • Topologies • Email **Interfaces** • User Interfaces • Creating an interface
Vocabulary And Key Terms	Embedded System Registers Buses RAM & ROM Virtual Memory Robust Portability Transistors Network N.I.C Card Topology Router & Switch Protocol User Interface
Assessment	End of unit assessment (10) • Students required to answer a series of questions on the basics of computer Science

Key Stage 4 Year 10 – Long Term Planning – BTEC Digital Information Technology

	Autumn term	Spring term	Summer term
Knowledge	Component 1 – Exploring User Interface Design Principles and Project Planning Techniques Preparation for the Non-Examination Assessment (NEA) to be completed in Spring term Y10 **Learning Outcome A:** • Types of user interface • Interface uses • Factors affecting interface choice • Hardware & software influences • Audience accessibility needs • User interface design principles • Retaining user attention • Intuitive designs	Component 1 – Exploring User Interface Design Principles and Project Planning Techniques Coursework Students will develop their knowledge and understanding of what makes an effective user interface and how to effectively manage a project. They will use this understanding to plan, design and create a user interface. The assignment for this component consists of four tasks. Task 1 Complete a project proposal template using a project proposal brief, taking into consideration the purpose and audience, project	Component 2 – Collecting, Presenting and Interpreting Data Preparation for the Non-Examination Assessment (NEA) to be completed in Autumn term Y11 **Learning Outcome A:** • Characteristics of data and information • Representing Data • Ensuring data is suitable for processing • Data collection • Quality of information • Sectors that use data modelling • Threats to individuals **Learning Outcome B:** • Data processing methods

	• Designing a user interface **Learning Outcome B:** • Project planning techniques • Project proposals and plans • Initial designs • Developing user interfaces **Learning Outcome C:** • Reviewing interfaces	requirements, user accessibility needs and any constraints. Use software to create a project plan using project planning and design methodologies and taking into consideration the project proposal brief and overall timescales for the project. Task 2 Design an initial user interface for four screens of a user interface that meets user requirements and user accessibility needs and other specific hardware and software needs and design considerations. Task 3 Use their initial design to develop a working prototype of the four screens of the user interface that meets user requirements and user accessibility needs. Task 4 Review their user interface and project planning techniques against the following criteria • user requirements • ease of use • design principles • accessibility features.	• Producing a dashboard **Learning Outcome C:** • Drawing conclusions based on data findings • How presentation affects understanding
Vocabulary And Key Terms	Graphical user interface (GUI) Windows, Icons, Menus, Pointer (WIMP) Sensors Accessibility		Processed Sparklines Validation Verification Primary data Secondary data
Assessment	Non-Examination Assessment (NEA) Assessment Criteria Task 1		Non-Examination Assessment (NEA) Assessment Criteria Task 1

	• appropriate consideration of the project requirements with accurate reference to the project brief • appropriate consideration of the user requirements with accurate reference to the project brief • appropriate consideration of the constraints with accurate reference to the project brief • appropriate consideration of timescales, including tasks and sub-tasks with accurate reference to the project brief • appropriate consideration of key milestones with relevant reference to realistic timings • appropriate consideration of task dependencies with accurate reference to the project brief. Task 2 • developed initial designs that meet user requirements • appropriate consideration of user accessibility features with accurate reference to the project brief • appropriate consideration of design visualisation including input or output screens with accurate reference to the project brief. Task 3 • appropriate use of design principles with effective use of layout, whitespace and consistency • appropriate use of navigation methods with accurate reference to the project brief • appropriate consideration of user experience and accessible needs with accurate reference to the project brief. Task 4 • developed and appropriate lines of reasoning on how the user interface meets user requirements and ease of use • developed and appropriate lines of reasoning on the use of design principles and accessibility features • developed and appropriate lines of reasoning on the use of design principles and accessibility features	• developed and appropriate account of the impact of the data • lines of reasoning that are appropriate and logical and related to the context of the scenario • appropriate suggestions to the context of the scenario. Task 2 • appropriate use of the required data manipulation, advanced data manipulation and data processing methods • accurate results produced from the manipulation and processing of data • appropriate data summaries used, showing accurate results • appropriate use of a range of presentation methods • appropriate use of a range of presentation features

Key Stage 4: Year 11 – Long Term Planning – BTEC Digital Information Technology

	Autumn term	Spring term	Summer term

Knowledge	Component 2 – Collecting, Presenting and Interpreting Data Coursework Students will understand the characteristics of data and information and how they help organisations in decision making. They will use data manipulation methods to create a dashboard to present and draw conclusions from information. The assignment for this component consists of three tasks. Task 1 Explore the suitability of two given data collection methods used by an organisation for a given dataset. Task 2 Carry out different manipulation and processing methods in order to create a dashboard, providing data summaries using appropriate presentation methods and features. Task 3 Analyse a dataset, present their findings and draw conclusions based on these findings. Explore how presentation affects understanding in the dataset and how they could be improved.	Component 3 – Effective Digital Working Practices Students will explore how organisations use digital systems and the wider implications associated with their use. **A - Modern Technologies:** **Modern Technologies:** • Communication Technologies • Features of Cloud Storage • Features of Cloud Computing • Platform Selection • How modern and traditional systems work • Implications for organisations when choosing **Impact of Modern Technologies:** • Changes to teams by modern technologies • Modern technologies on manage • Communication using modern technologies • Inclusivity by modern technologies • Positive and negative impacts **B - Cyber Security:** **Threats to data:** • Why they are attacked • External threats • Internal threats • Impact of security breach **Prevention & Management:** • User access protection • Data level protection • Finding vulnerabilities **Policy:** • Defining Responsibilities • Defining Security Parameters • Disaster Recovery Policy • Actions after an attack

Vocabulary And Key Terms	<u>Functions</u> SUM, AVERAGE, MIN, MAX IF, WHATIF, SUMIF VLOOKUP, HLOOKUP COUNTBLANK, COUNTIF, COUNTA NOT, AND, OR	
Assessment	Non-Examination Assessment (NEA) Assessment Criteria Task 3 • complete and appropriate set of findings provided from the dataset and dashboard. • conclusions with lines of reasoning that are relevant to the context of the scenario • lines of reasoning on the use of presentation features • lines of reasoning on the use of presentation features	1hr 30min external assessment of the knowledge, understanding and skills acquired and developed across the qualification

<u>Appendix – ICT Vocabulary and Key Terms - Definitions</u>

<u>Computing KS3 Vocab</u>

HTML -Hyper Text Markup Language; the code that tells the browser how to create the webpage.

BROWSER - The software that reads the HTML and outputs the website e.g. Google Chrome, Microsoft edge, Mozilla Firefox etc.

TAG - The code in <> brackets that forms instructions.

FORMAT - To change the appearance of content e.g. format the title as bold Arial size 14.

FILE EXTENSION - The (often) 3 letters after the dot in a file name, which shows what kind of file it is e.g. a picture could be a jpg, a png, a gif etc.

HEXADECIMAL - A system of counting in a base of 16, rather than a base of 10 (which known as decimal or denary).

LINK -Content that when clicked on will take the user to another page. Visited links are links for which the address/file has already been accessed and stored on the browser history. An active link is a link you are currently clicking on.

TABLE -An array of columns and rows used to hold content in the correct layout on the page.

MARQUEE -A form of dynamic HTML, a marquee will move the text across the screen.

PIXEL -A coloured dot, usually a square, that makes up an image.

BINARY -A system of counting using only 1s and 0s. Each pixel will have a binary number denoting the RGB values, and hence its colour.

PIXILATION -When individual pixels become visible when an image is altered e.g. resized.

LOSSY COMPRESSION - A system of compressing an image (making the file size smaller) that involves permanently deleting parts of the file. E.g. reducing the colour depth.

LOSSLESS COMPRESSION - A system of compressing an image (making the file size smaller) that does not involve permanently deleting parts of the file. E.g run length encoding.

SAMPLE RATE - The number of samples taken from the original sound wave when converting an analogue sound to a digital format. Higher sample rates give better quality but increase file size.

BIT RATE - The number of bits (1s and 0s) used to represent each sample. Higher bit rates give better quality but increase file size.

METADATA - Data stored about the file e.g. author, date created, file size etc.

ETHICS - An agreed set of principles seen as a “moral standard” by society.

DIGITAL DIVIDE - An umbrella term for the gap between those who have access to technology and those who don’t.

OPEN SOURCE SOFTWARE -Often free software, for which the source code is viewable and changeable.

PROPRIETARY SOFTWARE - Software which is “owned”, and therefore the code is not viewable or changeable. Almost always has to be bought.

SEARCH HISTORY - A log of web sites visited by a particular user or computer.

ARTIFICIAL INTELLIGENCE - Computer systems able to perform tasks normally requiring human intelligence.

PRIVACY SETTINGS - Settings on a social media account controlling/restricting access to certain information.

INTELLECTUAL PROPERTY - An individual or organisation’s property that is the result of their creativity.

SANCTIONS - Punishments imposed for certain offences

<u>Key Stage 4 Command Words</u>

Annotate - Identify and label the diagram and state what each, i.e. feature/process/characteristic is for, their purpose etc.

Describe - Present two (or more) linked descriptive points on characteristics, features, uses or processes. Do not need to include a justification or reason.

Discuss - Consider the different aspects in detail of an issue, situation, problem or argument and how they interrelate.

Draw - Produce a diagram or process flow using information from the given context.

Evaluate - Consider various aspects of a subject's qualities in relation to its context such as: strengths and weaknesses, advantages and disadvantages, pros and cons. Come to a judgement supported by evidence which will often be in the form of a conclusion.

Explain - Present one point that identifies a reason, way, benefit, or importance, etc. and a second point that justifies/explains the first point. Where used, a third point is a further expansion of the justification/explanation.

Give - Provide a response, i.e. feature, characteristic or use of.

Identify - Select the correct answer from the given context. State Recall from memory facts, terms, processes, legal implications, etc. or provide the correct answer to the given context.