Key Stage 3 and 4 Computing Curriculum

Statement of Intent

We study computing because it is important economically, socially and culturally. Our curriculum aims to empower children to be active producers of technology rather than passive consumers. We deliver a broad curriculum that is divided into three strands incorporating computer science, creative media and digital literacy. *Computer science* is about understanding how computers work. This includes writing code and developing computational thinking skills. *Creative media* is concerned with creating products such as graphics, animations and websites using multimedia applications. *Digital Literacy* is using technology in a functional and safe way and consists of the basic skills that we all need to be able to participate fully in the digital world which includes using and communicating with technology in a safe and appropriate way.

The Curriculum

We deliver the broad three strand curriculum that is relevant, inclusive and engaging for all students at KS3 with 1 lesson per week. We offer two non-mandatory qualifications at KS4. These are the AQA GCSE computer science and OCR Creative iMedia qualifications. Consequently, we deliver the KS4 curriculum in computing in other subjects namely mathematics, science and English. At KS5 we deliver the AQA A level specification in computer science.

KS4 National Curriculum in Computing

GCSE computer science

- Algorithms
- Programming
- Data Representation
- Computer Systems
- Computer Networks
- Cyber Security
- Ethical, legal and social consequences of technology
- Software Development

Creative iMedia

- Pre-production skills
- Creating digital graphics
- Creating a Website
- Creating animation/film/sound

National Curriculum	**CVC mapping**
develop their capability, creativity and knowledge in computer science, digital media and information technology	*Science:* • Filming waves in solids and liquids • Data loggers -light gates measure final speed of trolley down a ramp • Temperature probes over time - Collect data and input into spreadsheets to create graphs *English:* • Use IT for consolidating end of unit. This can be through Prezi presentations, and films with recorded poetry for instance. • CE day activity PSHE • Writing CV and covering letters
develop and apply their analytic, problem-solving, design, and computational thinking skills	*Maths:* flowcharts, iterative methods
understand how changes in technology affect safety, including new ways to protect their online privacy and identity, and how to identify and report a range of concerns	Assemblies on e-safety with follow up during tutor time

The KS4 curriculum is delivered through English, mathematics and science because not all pupils opt for either computer science or iMedia at KS4.

KS3 National Curriculum in computing

design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems	Year 7: Sequencing Use Flowol which is flow chart software for modelling traffic lights, temperature control and various other systems Year 9: Spreadsheet modelling
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	Unplugged activities Linear search Binary search Compare linear and binary search Bubble sort
use two 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	Year 7 Scratch: input, output, variables, selection, iteration, concurrency, lists, broadcast Logo to draw shapes Use functions in BYOB Python: input, output, variables, selection, iteration, lists
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]	Boolean logic in searching Unplugged Boolean login and creating circuits Binary conversion
understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems	Year 7 hardware and software: inputs, processing, output, storage Year 9: Unplugged networking activities
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	Unplugged activities around: ASCII Sound Pictures
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 TV adverts – sound, video and images footage. Collecting data for database.
create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability	Photoshop, and other multimedia for movie making, sound
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	E-safety – Through lessons and through assemblies.

Program of study 2019-2020

	Year 7	Year 8	Year 9
Autumn 1	AUP, login and email Go4schools and introduction to network Baseline test (Assessment 1) E-safety – Create poster Research skills	Spreadsheets 1	Spreadsheets 2
Autumn 2	Bebras (Assessment 2) History of computers - PowerPoint skills - (Assessment 3)	Bebras Databases	Bebras Python 2
Spring 1	Inputs and Outputs - Desk Top Publishing (Assessment 4)	Python 1	Algorithms and data representation
Spring 2	Sequencing with Flowol	Animation	BYOB
Summer 1	Logo Programming	Websites	Product launch using multimedia – images - poster
Summer 2	Scratch	Advertising campaign using multimedia – Making radio advert	Film advert

Year 7

Introduction to computing

Introduces the basic concepts and tools to new pupils.

Lesson	Topic	Curriculum reference
1	Expectations Acceptable use policy Login to network	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
2	Email Go4Schools	
3	Baseline test	
4	Files and folders	
5	E-safety and DTP	
6	E-safety and DTP	
7	Write letter to head teacher about E-safety	

History of computing

Pupils learn about the history of computing and use presentation software for different audiences

7	Effective searching	create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
8	Research and Identifying suitable sites	
9	Bebras	
10	History of computing – Researching People	
12	History of computing – Researching computers	
12	History of computing – Adding in hyperlinks and triggers	
13	History of computing - Audience	
14	History of computing – evaluating and making improvements	

Input, Processing and Outputs

This topic covers hardware, software, input, processing, storage and output and also covers wired and wireless networking

15	Hardware and software Inputs and Outputs	understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
16	Processing and storage	
17	Wired and wireless networking	
18	Create a brochure – on inputs / outputs processing and storage / networking	
19	Create a brochure	
20	Create brochure	

Sequencing

Algorithms and flow diagrams using Flowol	
National Curriculum Link: design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems	
1	**Introduction to flowcharts** • Explain what an algorithm is • Create flowcharts Starter: write down the steps for getting up in the morning Teacher explanation: What is an algorithm? Introduction to flowcharts and flowchart symbols Paper exercise put together a flowchart for making a cup of tea using the cards. Task create a flowchart for getting up in the morning Task: create a flowchart for adding two numbers Extension task: Create flowchart for thermostat control
2	**Processing and loops** • Create flow diagrams that has processing and loops Starter: Use the cards to identify a sequence for a set of traffic lights

	Teacher demonstration: Introduction to Flowol software Tasks create sequences for the following: • Zebra crossing • school crossing • traffic lights Plenary: Show exemplar student to the whole class
23	Input, concurrency and decisions Pelican crossing, traffic lights
24	Decisions Lighthouse, house control, greenhouse
25	Subroutines

Scratch

Introduction to programming concepts using Scratch

26	Input and outputs	use two 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
27	Sequencing traffic lights	
28	Selection	
29	Loops; drawing shapes	
30	Assessment: Draw a complex scene use all techniques,	
31	Concurrency and broadcasting	
32	Applying programming concepts to create game	
33	Applying programming concepts to create game	

Logo

Logo is a gentle introduction to text-based programming.

34	Drawing shapes Calculating angles	use two 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
35	Using repeat command Creating and using procedures	
36	Calling user defined procedures within procedures Using colours Drawing shapes with colours Draw patterns, flags,	
37	Using procedures with parameters	
38	Assessment: Draw a complex scene use all techniques	

Year 8

Spreadsheets

1	Cell referencing and formatting	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
2	Formatting and sorting	
3	Formulas BODMAS	
4	Functions =MIN() =MAX() =AVERAGE() =SUM()	
5	More functions =COUNT() =COUNTA() =COUNTBLANK() =COUNTIF()	
6	IF statements	
7	Charts Consolidation Assessment	

Databases

8	Data Types Collect data on minibeasts	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
9	Enter in data on minibeasts into table Create a form Enter in data on minibeasts into table	
10	Carry out queries on the database using SELECT	
11	Create Top Trumps cards using a report	
12	Evaluation and contingency	

Python 1

13	Output	use two 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
14	Input	
15	Arithmetic, relational and Boolean operators	
16	Assignment and data types	
17	Selection: If statements Create a quiz	
18	For loops: drawing shapes using turtle.	
19	More on for loops for drawing shapes	

Animation

20	What is animation Create simple frame-by-frame animation	create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
21	Layering	
22	Motion tweening	
23	Shape tweening	
24	Create animation	
25	Create animation	
26	Review, evaluate and improve animation	

Website

27	Introduction to HTML	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
28	More HTML	
29	Create 1 page of website	
30	Create buttons and graphics for website	
31	Complete remaining 3-4 pages	
32	Review, evaluate and improve website	

Advertising campaign - Sound

33	How is sound represented in a computer Introduction to Audacity Edit Dr Who / Beawolf clips	create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability 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
34	Listen to some radio advertisements and analyse Write a script for a radio advertisement to advertise your product. Include time line, sound effects, music and so on	
35	Complete the script Collect and edit artifacts for creating the radio. Make recording, collect music	
36	Edit the artifacts to produce a 30 second radio advertisement	
37	Edit the artifacts to produce a 30 second radio advertisement	
38	Present advert to the whole class and evaluate	

Year 9

Spreadsheets 2

1	Review of spreadsheet 1 unit and recap ideas from there.	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 design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
2	Review and absolute cell referencing	
3	Use of LOOKUP tables	
4	Application of list function	
5	Conditional formatting	
6	Spreadsheet modelling	
7	Spreadsheet modelling and Goal seek	
8	Assessment	

Python 2

This follows on from Python studies in Year 8. We spend some time revising work from the Year 8 sow before progressing on to new programming concepts

9	Recap: input and output	use two 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
10	Recap: assignment, operators and selection	
11	Recap FOR loops While loops	
12	1-D lists	
13	Functions	
14	Application of techniques using EasyGui	
15	Application of techniques using EasyGui	

Algorithms and data representation

This unit can be delivered unplugged.

16	Binary denary conversion	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 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
17	Character coding	
18	Bitmap graphics	
19	Vector graphics	
20	Sound	
21	Fetch execute cycle	
22	Boolean logic gates	
23	Boolean logic gates	
24	Searching algorithms	
25	Sorting algorithms	

Product design- BYOB

26	Recap of Scratch features	use two or more programming languages, at least one of which is

27	Create jumping frog game that makes use of functions.	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
28	Create jumping frog game that makes use of functions.	
29	Introduction to product launch event Design and create own game	
30	Design and create own game	
31	Design and create own game	

Product design Images

32	Show how to use some features of photoshop	create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability 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
33	Create a poster for the game	
34	Create some images from the game	
35	Create a DVD case for the game	

Product design – TV advert

36	Crate a TV ad for the game. Include screenshots and gameplay screencasts	create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability 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
37	Create a TV ad for the game Include sound, music, effects and voiceover if needed	
38	Final preparation for the launch event	
39	Launch event	

References

Department for Education, 2013, Computing programmes of study: key stages 3 and 4 National Curriculum in England.

Annex 1 - Computing across the curriculum at CVC

Subject/department	Application	Purpose	Approx. number of lessons	Year groups
Statistics	Spreadsheet	Calculating various statistical functions with real data sets, e.g. standard deviation, correlation (Spearman's rank), averages, quartiles etc	5-10	Year 10 (after school option)
Geography	ArcGIS			KS3
DT	2D design Photoshop Google Sketchup Microsoft Illustrator InDesign	Technical drawing in 2D and 3D, graphics		KS3,4,5
PSHE	Word	Writing letters and CV for careers	2	KS4
Business	Office applications	Word, presentations, spreadsheets for financial forecasting		
Photography	Photoshop on PC and snapseed app	Creating graphics and editing photographs	Most lessons across yr 10 and 11	KS4
Photography A Level	Photoshop and powerpoint	Editing and presenting	All year 12 and yr 13 lessons	12/13
Photography project yr 9	Snapseed app on ipads/phone	Yr 9 photog intro to editing	8	9
Art **Animation project**	Stop frame app	Animation skills	8	8
Music Technology	GarageBand / Logic pro, apple mac, Sibelius	Music editing		KS3-KS5
PE	Dartfish / Apple iPad Hosand, HR monitors and server	Video analysis		

Annex 2 - Digital Literacy

Can be delivered as standalone lessons or embedded throughout program.

		Curriculum Links

Functional skills	• Writing formal letters
	• Writing formatted reports
	• Using spreadsheets for budgeting
	• Go4Schools
	• Login to school network from home
	• Organising files and folders
	• Cloud computing (we have Google and Microsoft onedrive)
	  • backup
	  • online tools
	  • collaboration
		Literacy
		
		Financial planning

E-safety	• Cyberbullying • Recognising and avoiding scams • Managing your private data online • Importance of secure login and password • Computer misuse Act and Hacking	Resilience
Effective communication	• Implications of negative use of social media • Using social media in a positive way e.g. for campaigning, writing reviews • Different types of communication • Email, Social media • Considering appropriate purpose and audience • Creating and delivering *effective* presentations	Literacy
Find and select information	• Use web for research • Identify reliable and unreliable websites • Referencing and acknowledging sources • Copyright, licenses and plagarism • Use school library system	Research
Collaboration	• Using a variety of tools for collaborative project work. • Wiki • padlet.com • Googledrive	Project Teamwork