

Computing at Lord Lawson of Beamish Academy

What are the aims of the department?

Computing as a subject develops a range of skills and knowledge that are vital for students to operate in the modern, digital world. Students must learn to operate safely and securely using digital devices, and the Internet, in order to protect themselves from people and programs with malicious intent. They will learn how to use computer systems effectively, so that they have the skill set to support a variety of future career choices. They will also learn about how computer systems work, from the hardware itself, to the ways that computer programs are written, helping students to be prepared for a future with possibilities beyond those currently available.

Our aim is to inspire students to become developers, analysts, or to prepare them with a skill set that they will be able to use to be successful in any chosen career.

Students studying Computing will develop knowledge of online safety, how computers work, and ways of thinking like a computer scientist – learning about Boolean logic and how data is stored, processed and used.

What will my child study in years 7, 8 and 9?

In key stage 3 students study 5 units of work per year that assess a range of computing concepts. Please click on the links below to see the focus of the unit, a detailed overview of the fundamental knowledge and skills your child will develop in each unit of work and the key vocabulary

Year 7

Year 8

Year 9

What will my child study in years 10 and 11?

In key stage 4 students can opt to study either GCSE Computer Science and/or BTEC Digital Information Technology.

In GCSE Computer Science, students will study for two exam papers. The focus of the first exam is 'Computer Systems', and students will learn in more depth about the ways that computer systems work, how data is represented in computers, systems software, ethical and legal issues, and networks. The second exam is focussed on 'Algorithms and Programming Concepts', for which students will learn about programming fundamentals, developing robust programs, integrated development environments, boolean logic, and common algorithms used for searching and sorting data.

In BTEC Digital Information Technology, students complete 3 components. Two of the components are internally assessed, these covering 'Exploring User Interface Design Principles and Project Planning Techniques', and 'Collecting, Presenting, and Interpreting Data'. The final component, covering 'Effective Digital Working Practices' is assessed by a terminal exam.

Please click on the links below to see the focus of the unit, a detailed overview of the fundamental knowledge and skills your child will develop in each unit of work and the key vocabulary

Year 10

Year 11

What will my child study in years 12 and 13?

In Key stage 5 students can choose to study the BTEC National Extended Certificate in Computing. Please click on the links below to see the theme/topic/focus of the unit, a detailed overview of the fundamental knowledge and skills your child will develop in each unit of work and the key vocabulary

Year 12

Year 13

Year 7

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Topic	<p>School Systems and Online Safety</p> <p>Students will be introduced to the school computer systems, and learn about dangers of using social networks and cyberbullying.</p> <ul style="list-style-type: none"> • Students will learn the rules of using school computer systems safely and correctly • Students will consider different scenarios, identifying the dangers and recommending action to take • Students will create and deliver a presentation about Cyberbullying 	<p>Using Media</p> <p>During this unit, learners develop their understanding of information technology and digital literacy skills. They will use the skills learnt across the unit to promote a real-world cause that they would like to gain support for.</p> <ul style="list-style-type: none"> • Students look at features of a word processor and formatting skills • Students learn about licensing and copyright law • Students learn about credibility of sources and critique digital content • Students will construct a blog based on credible sources 	<p>Programming concepts with Scratch and MicroBits</p> <p>Students will be introduced to key programming constructs using visual programming environments.</p> <ul style="list-style-type: none"> • Sequencing instructions • Creating and using variables • Controlling program flow with selection • Using count-controlled iteration to repeat blocks of code • Students will investigate programs by predicting outcomes, modifying existing programs, and then writing their own programs 	<p>Spreadsheets</p> <p>Students will be introduced to spreadsheets, learning formula and functions that can be used to process data.</p> <ul style="list-style-type: none"> • Cell references, rows and columns • Formatting techniques in a spreadsheet • Using basic formula • Using functions – SUM, MIN, MAX, COUNT • Creating appropriate charts 	<p>Networks</p> <p>Students learn about what a network is, and the benefits of using networks, before looking at the hardware involved and how data is transmitted.</p> <ul style="list-style-type: none"> • What is a computer network • How is data transmitted across a network • Network Hardware • Technologies used for wired and wireless connections • What is the Internet? • What is the World Wide Web?
Key vocabulary	Password, Cyberbullying, Social Network, Audience, Purpose	Formatting, Copyright, Credibility, Blog	Sequence, Operators, IF-ELSE (Selection), Loop (Iteration), Variable	Cell, Cell Reference, Column, Row, Formula, Function, Data, Chart	Network, Protocol, Bandwidth, Internet, World Wide Web

Year 8

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Topic	<p>Understanding Computers Students are introduced to different components that make up a computer. They will look at how data is stored in binary, and explore what is meant by machine learning and artificial intelligence.</p> <ul style="list-style-type: none"> • The main parts of a computer system, including input and output devices, the CPU, and storage devices • Students will learn what binary numbers are, and how to translate numbers to and from binary • Students will explore the concept of convergence • Students will learn about machine learning, and apply machine learning concepts to train a system to recognise images 	<p>Vector Graphics This unit offers students the opportunity to design graphics using vector graphic editing software.</p> <ul style="list-style-type: none"> • Students will learn about what vector graphics are, and where their use if appropriate • Students will learn to use basic shapes and manipulate their properties • Students will learn to decompose an image into separate shapes, to help them to create vector graphics • Students will learn ways of combining objects to create objects suitable for purpose 	<p>HTML Students will be introduced to the technologies that make up the Internet and the World Wide Web, exploring the building blocks of HTML, and CSS. Students will investigate how websites are catalogued and organised for effective retrieval by search engines.</p> <ul style="list-style-type: none"> • What is HTML, and using it to structure and modify a static web page • What is CSS, and using it to style static web pages. • Describe what a search engine is, and how they select and rank results. • Using search technologies effectively 	<p>Introduction to Programming using Python Students will be introduced to the programming using the text-based python programming language</p> <ul style="list-style-type: none"> • Writing simple programs that display messages, assign values to variables, and receive keyboard input • Using arithmetic expressions • Using appropriate data types • Using relational operators to form expressions • Using selection statements and conditional iteration to control program flow 	<p>Mobile App Development Students will build upon the programming concepts they have learned and undertake a project that uses event driven programming to create a mobile app</p> <ul style="list-style-type: none"> • Students will learn to decompose a problem • Students will learn about GUI elements • Students will learn how events control program flow • Students will establish user needs and use these to evaluate their success
Key vocabulary	CPU (Central Processing Unit), Memory, Storage, Input, Output, Binary, Convergence, Artificial Intelligence, Machine Learning	Vector, Graphic, Logo, Icon, Illustration, Shape, Path, Combine	Internet, World Wide Web, HTML, CSS, Webpage, Website, Image, Navigation, Links, Select, Rank, Search Engine	Variable, input, operator, assign, data type, selection (if), iteration (loop)	Decompose, events, graphical user interface (GUI), variable, input, output

Year 9

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Topic	<p>Logic Students learn about computational logic and the methods computer scientists use for problem solving:</p> <ul style="list-style-type: none"> • Common Boolean Operators and Logic Gates • Algorithmic Thinking • What is abstraction and how it is used • What is decomposition and how is it used • How data can be compressed 	<p>Programming with Python: Next Steps Students will use the turtle module in python to predict, investigate, modify and make programs.</p> <ul style="list-style-type: none"> • Sequencing instructions • Using count controlled and conditional loops • Using procedures and functions, and the difference between them • Importing and using external modules – turtle graphics and random 	<p>Data Science Students will be introduced to data science, becoming empowered to know how to use data to investigate problems and visualise data to identify patterns and trends.</p> <ul style="list-style-type: none"> • What is data science • How visualising data helps identify patterns and trends • Large data sets, and their use in daily life • Collecting, processing, and investigating data • Using findings to support a recommendation 	<p>Cyber Security Students will learn about threats to computer systems, how to protect against them, and the legal aspects of security</p> <ul style="list-style-type: none"> • How human error causes risks & social engineering • Common cyber attacks – malware, hacking, DDoS, brute force • Strategies to minimise risks • Data Protection and Computer Misuse Act 	<p>AudioVisual Data Representation Students will look at how computers store data in binary</p> <ul style="list-style-type: none"> • How images are represented and factors that affect image quality • How sound is represented and factors that affect sound quality • Calculating file sizes • Types of compression and their impact on images and sound
Key vocabulary	Algorithm, Boolean, Logic, Logic Gates, Abstraction, Decomposition, Compression, Lossy, Lossless	Sequence, Selection, Iteration, Count controlled, condition controlled, procedure, function, random	Data science, visualisation, pattern, trend, data cleansing	Malware, virus, DDoS, brute force, cyber attack, social engineering, anti-malware, legislation, data protection, misuse	Bitmap, binary, pixel, resolution, sound wave, sampling, compression, lossy, lossless

Year 10 BTEC Digital Information Technology

	Component 1	Component 2
Topic	<p>User Interface Design and Project Planning Techniques</p> <p>Students will investigate different types of user interface, their key characteristics and how they support different user needs. Students will also investigate design principles and how they ensure effective interface design.</p> <p>Students will be introduced to a range of different planning tools and why they are used.</p> <p>Students complete a project to meet a set of project requirements, gather feedback to refine their interface, and then evaluate the entire process</p> <ul style="list-style-type: none"> • Types of interface and their suitability for different users and purposes • Design Principles and the ways that they are implemented in systems to ensure that they can be used effectively • Planning tools and how they can be used to ensure smooth running of a project 	<p>Collecting, Presenting, and Interpreting Data</p> <p>Students will learn about ways that data can be gathered, and the impact that this can have on the suitability of the data. They will use spreadsheets to process data, performing calculations, and producing summaries of important information.</p> <ul style="list-style-type: none"> • Features of data, including common data types, and the impact of it's completeness and integrity • Data collection methods, and how this affects reliability and suitability of data • Data processing methods, including using formula, functions, and pivot tables in excel • Ways of presenting data effectively, including formatting techniques, tables, and charts • Interpreting information to identify trends and patterns in data, and using this to make informed judgements
Key vocabulary	User interface, graphical user interface (GUI), command line interface (CLI), menu, window, icon, pointer, gantt chart, storyboard, testing, evaluate, accessibility, usability, navigation	Data, information, data type, integrity, reliability, formula, function, pivot table, formatting, chart, interpreting, trend, recommendation

Year 10 and 11 BTEC Digital Information Technology

	Component 2	Component 3
Topic	<p>Collecting, Presenting, and Interpreting Data Students will learn about ways that data can be gathered, and the impact that this can have on the suitability of the data. They will use spreadsheets to process data, performing calculations, and producing summaries of important information.</p> <ul style="list-style-type: none"> • Features of data, including common data types, and the impact of it's completeness and integrity • Data collection methods, and how this affects reliability and suitability of data • Data processing methods, including using formula, functions, and pivot tables in excel • Ways of presenting data effectively, including formatting techniques, tables, and charts • Interpreting information to identify trends and patterns in data, and using this to make informed judgements 	<p>Effective Digital Working Practices In this component, students will learn about different aspects of how technology is used by organisations in working life.</p> <ul style="list-style-type: none"> • Modern technologies, including how organisations use communications technology, the cloud, and modern team working • Cyber Security, including common attacks on systems, and how they can be protected against • Implications of digital systems, including shared data, environmental issues, equal access, and legal issues such as data protection • Planning and communication, including data flow diagrams, flowcharts, and system diagrams
Key vocabulary	Data, information, data type, integrity, reliability, formula, function, pivot table, formatting, chart, interpreting, trend, recommendation	Cloud computing, cloud storage, WiFi, mobile data, shared data, hacking, malware, antivirus, firewall, social engineering, social network, data protection, computer misuse, copyright, data flow diagram, system diagram, flowchart

Year 10 GCSE Computer Science

	Unit 1	Unit 2
Topic	<p>Computer Systems Students will learn about the hardware and software that makes computer systems work, and the impacts that digital technology has on wider society</p> <ul style="list-style-type: none"> • Computer architecture, the job of internal components, and how common characteristics affects their performance • How computers store data for numbers, characters, images, and sound in binary, the units of data storage, converting numbers between binary, denary, and hexadecimal • Networks and topologies – different types of networks, factors that affect network performance, network hardware, and protocols for communicating over networks 	<p>Computational Thinking, Algorithms, and Programming Students will study the ways that computer programs are developed, common algorithms and development environments</p> <ul style="list-style-type: none"> • Programming fundamentals, including the use of variables, operators, sequences, selection, and iteration, procedures and function, data types, data structures, string manipulation, file handling, and SQL • Boolean logic, including AND, OR, and NOT. Logic gates, and using these to form logic circuits.
Key vocabulary	CPU (central processing unit), cache, registers, memory, storage, volatile, input, output, bit, byte, binary, hexadecimal, denary, network, internet, topology, compression, protocol, client, server	Variable, input, output, sequence, selection, count controlled iteration, condition controlled iteration, boolean, operator, data type, string, integer, float, boolean, array, procedure, function, algorithm, comment, abstraction, decomposition, pseudocode, trace table, syntax, logic, AND, OR , NOT, logic gate, logic circuit

Year 11 GCSE Computer Science

	Unit 1	Unit 2
Topic	<p>Computer Systems Students will learn about the hardware and software that makes computer systems work, and the impacts that digital technology has on wider society</p> <ul style="list-style-type: none"> • Threats to computer systems, including different forms of attack, and common prevention methods • Systems software, including the purpose and functionality of both operating systems, and utility software • Ethical, legal, cultural, and environmental impacts of technology 	<p>Computational Thinking, Algorithms, and Programming Students will study the ways that computer programs are developed, common algorithms and development environments</p> <ul style="list-style-type: none"> • How common algorithms for searching and sorting through data work, and the advantages and disadvantages of different algorithms • Producing robust programs, including the need for validation and authentication, how to protect programs that are written from misuse, and developing and implementing testing strategies. • Programming languages, and integrated development environments (IDE). How the IDEs aid program development. The difference between high-level and low-level languages. The purpose and characteristics of compilers and interpreters.
Key vocabulary	hacking, virus, DDoS, malware, anti-malware, firewall, operating system, utility software, defragmentation, user management, peripheral, encryption, compression, protocol, client, server	sort, search, binary search, linear search, bubble sort, merge sort, insertion sort, robust, validation, authentication, testing (normal, boundary, erroneous), IDE, comment, abstraction, decomposition, pseudocode, trace table, syntax, logic, IDE (integrated development environment)

Year 12 BTEC Computing

	Unit 2	Unit 7
Topic	Fundamentals of Computer Systems	<p>IT Systems Security and Encryption Students will investigate different types of security attacks, the vulnerabilities that exist, and techniques that can be used to defend IT systems of</p>

	<p>Students learn about how and why computer components, and the data they use, perform in certain ways, and the impact on the work of computing professionals.</p> <p>Students will explore the relationship between hardware and software, the ways components work individually, and together to store and process data. Students will study the way data is transmitted and used in computer systems, and the impact computing systems have on organisations and individuals</p> <ul style="list-style-type: none"> • Hardware and software used in computer systems, including computer architecture, and characteristics of components • Data processing and Data representation, including binary, binary coded decimals, binary arithmetic and negative and floating point numbers, text, and images • How data is organised, including the use of structures such stacks, queues, arrays, and lists, indices, and matrices • How data is transmitted, including communications channels, protocols, and encryption, and error detection methods • The use of logic and data flow in computer systems, including boolean logic, flowcharts and system diagram 	<p>organisations. Students will plan and apply suitable protection methods to a system and test it to ensure it is effective, before reviewing the protection.</p> <ul style="list-style-type: none"> • Current IT security threats, information security, and the legal requirements affecting the security of IT systems, including types of threats, and the impacts of breaches. • Investigate cryptographic techniques and processes used to protect data, including the ideas behind why encryption is used, learning about different cryptographic methods and how and why different encryption methods are used for different purposes • Examine the techniques used to protect IT systems from security threats, including physical security, policies and procedures, and software-based protection • Implement strategies to protect and IT systems from security threats, including group policies, anti-malware, configuring a firewall, wireless security, testing, and reviewing protection
Key vocabulary	<p>Computer system, storage, kernel, operating system, application software, utility software, processing, architecture, von neumann, Harvard, instruction cycles, execution speed, cache, register, binary, binary coded decimal, ASCII, Unicode, bitmap, resolution, bit depth, stack, queue, array, list, indices, matrices, communications channel, cypher, encryption, error detection, boolean, flowchart</p>	<p>Threats, virus, worm, trojan horse, DoS, DDoS, adware, spyware, ransomware, antivirus, firewall, backdoor, domain management, filtering, encryption, cryptography, cypher, key, hash, vpn, physical security, policy, procedure, access control</p>

Year 13 BTEC Computing

	Unit 1	Unit 14
Topic	Principles of Computer Science	Computer Games Development

	<p>This unit covers the principles that underpin all areas of Computer Science. It will develop computational thinking skills and apply the skills to solve problems.</p> <p>Students explore the logical and structured methods that computer systems process data to develop programs, processes and systems to solve problems</p> <ul style="list-style-type: none"> • Computational thinking, including decomposition, pattern recognition, generalisation, abstraction, and algorithm design • Standard methods and techniques used to develop algorithms, such as pseudocode and flowcharts • Programming paradigms – use of standard structures and conventions to build and develop accurate, efficient, and effective computer code to solve problems • Common and standard algorithms for sorting, searching, counting, validation, and using stacks and queues. • Types of programming and markup languages, including procedural programming, object-oriented programming, event driven programming, programming for the web, and translating code between languages 	<p>Students will investigate the technologies used in the computer gaming industry, and the implications for users, developers, and organisations. Students will analyse how user needs and preferences impact game design and the development of a computer game.</p> <p>Students will design, create, and review a computer game to meet requirements.</p> <ul style="list-style-type: none"> • Investigate technologies used in computer gaming, including social trends, and the technologies that are used in computer gaming • Design a computer game to meet client requirements, including computer games design processes and techniques, design documentation, and reviewing and refining designs • Develop a computer game to meet client requirements, including the principles of computer games development. Developing, testing, and reviewing computer games using quality characteristics of computer games.
<p>Key vocabulary</p>	<p>Decomposition, pattern recognition, generalisation, abstraction, algorithm, pseudocode, flowchart, paradigm, stack, queue, count, sort, search, validation, authentication, procedure, function, control structure, sequence, conditional, iteration, class, object, inheritance, encapsulation, polymorphism, data hiding, reusability, events, event handlers, trigger functions, platform, protocols, APIs (application programming interface), client, server</p>	<p>Genre, player, platform, publisher, developer, emerging technologies, artificial intelligence, hardware, CPU, GPU, memory, storage, input, output, connections, rendering, physics, collision detection, scripting, animation, visual style, assets, interaction model, narrative, setting, goals, actions, mechanics, structure, brief, algorithm, storyboard, API, timeline, test plan, constraints, schematics</p>

Year 13 BTEC IT

	<p>Unit 2</p>	<p>Unit 3</p>
<p>Topic</p>	<p>Creating Systems to Manage Information</p>	<p>Using Social Media in Business</p>

	<p>Students will examine the structure of data and its origins, and how an efficient data design follows through to an effective and useful database</p> <ul style="list-style-type: none"> • The purpose and structure of relational database management systems, including relational database management systems, manipulating data structures and data in relational databases, and normalisation • Standard methods and techniques to design relational database solutions, including relational database design, and design documentation • Creating a relational database structure, including producing databases as a solution to a problem, testing, and refining database solutions • Evaluating a database development project, including evaluating design documents, testing processes, and the database itself 	<p>Students will explore different social media websites, the ways in which they can be used and the potential pitfalls of using them for business purposes. Students will develop a plan to use social media strategies for business purposes to achieve specific aims and objectives. Students will implement the plan, developing and posting content, and interacting with others, before finally reviewing the effectiveness of the implementation of their plan.</p> <ul style="list-style-type: none"> • Explore the impact of social media on the ways in which businesses promote their products and services, considering different social media platforms, different uses of social media, and the associated risks and issues • Develop a plan to use social media in a business to meet requirements, including planning processes, analysing business requirements, planning and publishing content, developing an online community, developing a social media policy, and reviewing and refining plans • Implementing the use of social media in a business, including the creation of accounts and profiles, creation and publication of content, implementation of online community building, and data gathering and analysis to evaluate success
<p>Key vocabulary</p>	<p>Database, data type, function, table, query, form, report, macro, entity, relationship, entity relationship diagram, field, record, primary key, foreign key, composite key, user interface</p>	<p>Social media, target audience, brand, content, risks, issues, planning process, client, timescale, publish, online community, hashtag, scheduling</p>