Subject overview: KS5 Computer Science

Subject Rationale (Intent) linked to whole school curriculum mission

In brief (no more than four sentences)

Computer Science will develop students' intellectual curiosity on the use of computing and technology within the world we live in. Students will have a robust understanding of the role of computing in our lives and will analyse situations through complex problem solving. Students will develop transferable skills that they can apply in the wider curriculum, future education or employment.

Additional details

As a faculty we aim for students to develop a keen interest in the field of computer science. We develop students' creative and innovative skills to allow them to view the world through a digital prism. This will include computational thinking, problem solving skills, design systems and the ability to understand the power and limits of human and machine intelligence. Students will develop the ability to analyse, critically evaluate and make justified decisions.

In KS5 students complete the Pearson BTEC Extended Certificate in Computing syllabus

YEAR 12			
TERM	**Topic sequence** (What are you teaching?)	**Topic sequence rationale** (Why are you teaching this? How does it link to prior learning? Any notable links to St Edmund's curriculum mission St Edmund's curriculum mission	**Main method of assessment?**
Term 1:1	**Unit 2 Learning Aim A (Hardware and Software)** • Computer hardware in a computer system • Computer software in a computer system • Data Processing	We begin Year 12 doing learning aim A for Unit 2 (Fundamental of Computer Science). This topic develops pupils' declarative knowledge of how computer systems work. We start off by looking at the computer hardware in a computer system. For example the types of computer systems the internal components of them, different input, output and storage devices, then we look at the ways to improve the performance of the computer system. The next section of this learning aim is to look at the computer software in a computer system. This includes types of operating systems, the role of the kernel, user interfaces, the factors of the operating systems and the different types of software. The final part of this unit looks at data processing. In this part pupils look at the role of hardware and software in collecting data, then it looks at the role of data backup on individuals and organisations.	**Written assessment using exam board past paper questions**
	Unit 2 Learning Aim B (Computer architecture) • Approaches to computer architecture • The concepts of microarchitecture • Registers and register handling	This topic develops pupils' declarative knowledge of how computer architecture works with the computer system. This topic starts off looking at the different types of computer models and the facts that affect the choice and the impact of using different models, then it looks at the use and application of emulation. The next section of this topic looks at the concepts of microarchitecture. This looks at how the CPU works. This includes instruction cycles/sets, execution speeds, pipelining cache memory registers, features and uses of embedded systems and mobile CPU's. The final part of this topic looks at the different registers in the computer system. This includes the types of registers, the function and purpose of them and then the	**Written assessment using exam board past paper questions**

		role of interrupts in the CPU.	
	Unit 2 Learning Aim C (How data is represented by computer systems) • Number systems • Text representation • Image representation	This topic develops pupils' declarative knowledge of how data is represented and processed by computer systems. This starts by looking at number systems used in computer systems. This includes units of data and the binary coded system. Then pupils look at different number conversions including binary arithmetic, addition, subtraction, multiplication, division and floating point binary. The next part of this topic looks at text representation. In this pupils will look at the purpose, implications of using, storing, reading different character sets (ASCII and UNICODE). The final part of this topic looks at image representation. In this pupils will look at types of images (Bitmap and raster), then they will look at different parts of an image including image resolution, sample/bit depth and compression methods.	**Written assessment using exam board past paper questions**
	Unit 2 Learning Aim D (How data is organised on computer systems) • Data Structures • Indices and matrices	This topic develops pupils' declarative knowledge of how data is organised in computer systems. This starts off by looking at the features, applications and implications of using different data structures. These include, stacks, queues, arrays and lists. The final part of this topic looks at indices and matrices. This looks at the structure of them and their relationship with different types of data. This includes single and 2 dimensional arrays.	**Written assessment using exam board past paper questions**
Term 1:2	**Unit 2 Learning Aim E (How data is transmitted by computer systems)** • Transmitting data • Error Detection data • Error correction	This topic develops pupils' declarative knowledge of how data is transmitted by computer systems. This topic starts off by looking at the types of communication channels.Then the selection of connection methods transmitted by computer systems. This includes parallel and serial transmission, packet switching and protocols. The next part of this topic looks at encryption methods including ciphers symmetric and public key encryption. The next part of this topic looks at the different types of compressions (lossy and lossless). The final part of this topic looks at error detection and error correction in computer systems.	**Written assessment using exam board past paper questions**

	Unit 2 Learning Aim F (The use of logic and data flow in computer systems) • Boolean logic • Flow charts and system diagrams	This topic develops pupils' declarative knowledge of the use of logic and data flow in computer systems. The first part of this topic looks at boolean logic, the use, application and interpretation of it and pupils will use this to solve, complete and implement logic circuits. The final part of this topic looks at flowcharts and system diagrams. In this pupils will learn how to construct, interpret, evaluate flow charts sing appropriate symbols.	**Written assessment using exam board past paper questions**
Term 2:1	**Unit 7 Learning Aim A (Understand current IT security threats, information security and the legal requirements affecting the security of IT systems)** • Threat types • Computer network-based threats • Information security • Legal requirements • Impact of security breaches	After pupils have taken the external assessment for unit 2. They are to start their first coursework unit as part of their programme of study. Unit 7 IT Systems Security and encryption learning aim A is the first part they will complete. In this students will learn how to identify IT security threats that affect organisations. These include ,computer based and non computer based threats. Then pupils will learn how organisations keep information secure. The final part of this topic looks at the legal requirements around IT security. The laws that affect organisations	**Non Examined Assessment**
	Unit 7 Learning Aim B (Investigate cryptographic techniques and processes used to protect data) • Cryptographic principles • Cryptography methods • Applications of cryptography	The next learning aim investigates different cryptographic techniques and processes used to protect data. In this students will identify the principles and methods behind cryptography and then they will look at applications of how organisations can protect data.	**Non Examined Assessment**
Term 2:2	**Unit 7 Learning Aim C (Examine the techniques used to protect an IT system from security threats)** • Physical security • Policies and procedures • Software-based protection	The next learning aim investigates the tools and techniques to protect an IT system from a range of security threats. In this pupils will lear the physical security. This includes room security, backing up data and IT disaster recovery plans. Then pupils will learn about the different polices and procedures that protect organisations. These include security audits, security updates, and removing backdoors. The final part of this learning aim looks at software based protection methods.	**Non Examined Assessment**

Term 3:1	**Unit 7 Learning Aim D (Implement strategies to protect an IT system from security threats)** • Group policies • Anti-malware protection • Firewall configuration • Wireless security • Access control • Testing and reviewing protection applied to an IT system • Skills, knowledge and behaviours	The next learning aim pupils will learn how to implement strategies to protect an IT system from security threats. These include group polices, anti-malware protection, firewall configuration, wireless security, Access control. Then pupils will learn how to test and review these protection methods for an organisation's computer system.	**Non Examined Assessment**
Term 3:2	**Unit 1 Learning Aim A (Computational Thinking)** > Decomposition > Pattern Recognition > Abstraction > Algorithm Design	We then start learning Aim A for unit 1. This looks at computational thinking methods to solve computer science problems. This topic develops pupils' declarative knowledge of the design, use and evaluation of computational abstractions that model the state and behaviour of real world problems and physical systems.	**Written assessment using exam board past paper questions**

YEAR 13			
TERM	**Topic sequence** (What are you teaching?)	**Topic sequence rationale** (Why are you teaching this? How does it link to prior learning? Any notable links to **St Edmund's curriculum mission**	**Main method of assessment?**
Term 1:1	**Unit 1 Learning Aim B (Methods and techniques to develop algorithms)** > Pseudocode > Flowcharts	We begin Year 13 doing learning aim B for Unit 1 (Principles of Computer Science). We then move onto using computational thinking methods to analyse and write code using pseudocode and flowcharts. Pupils will put into practice what they learn in Learning aim A to develop pupils'	**Written assessment using exam board past paper questions**

		declarative knowledge on how to construct algorithms using pseudocode and flowcharts. In this topic pupils will construct programs, write, amend and fix code, using sequence, selection and iteration programming constructs.	
	Unit 1 Learning Aim C (Programming Paradigms) > Modelling data within a program > Arithmetic operations > Built-in functions > Validating data	We then move onto learning aim C. This is to apply content covered in learning aim B to advanced features of programming paradigms. This topic will develop pupils' declarative knowledge about the standard structures and conventions (programming paradigms) used to build and develop accurate, efficient and effective computer code to fulfil identified criteria and solve problems.	**Written assessment using exam board past paper questions**
Term 1:2	**Unit 1 Learning Aim C (Programming Paradigms)** > Control structures > Data Structures > Common/standard algorithms	This topic will develop pupils' declarative knowledge about the standard structures and conventions (programming paradigms) used to build and develop accurate, efficient and effective computer code to fulfil identified criteria and solve problems.	**Written assessment using exam board past paper questions**
	Unit 1 Learning Aim D (Types of programming and mark-up languages) > Procedural Programming > Object-orientated programming > Event driven programming > Coding for the web > Translation	The Final learning aim of unit 1 considers different types of computer programming. This underpins the content covered so far, especially writing code (learning aim B) and programming paradigms (Learning Aim C). This topic will develop pupils' declarative knowledge about the types of computer programming (procedural, object oriented and event driven). They will also look at how to write code for the web using html, CSS and Java script. They will also look at the differences between client-side and server side processing.	**Written assessment using exam board past paper questions**
Term 2:1	**Unit 15 Learning Aim A (Understand the principles of website development)** > Purpose and principles of website products > Factors affecting website performance	After pupils have taken the external assessment for unit 1. They are to start their last unit as part of their programme of study. Unit 15 website development learning aim A is the first part they will complete. In this they will analyse the purpose and principles of different website products. They will also identify and describe the different factors that affect the overall performance of different websites.	**Non Examined Assessment**

	Unit 15 Learning Aim B **(Design a website to meet client requirements)** > Website design > Common tools and techniques used to produce websites	We then move onto learning aim B. Students will use what they learnt in learning aim A (Purpose and factors affecting website performance). In this they will learn declarative knowledge the principles behind good website design. Then they will use procedural knowledge to apply these principles from learning aim to to plan a website for a client's website. In this they will produce requirements, prototypes, storyboard client scripting add animation, graphics and interactivity to their plan. The next part of this topic is to consider the legal and ethical considerations to the website. The final part to this learning aim is to add common tools and techniques to their plan. This includes HTML Tables forms, navigation menus, hyperlinks and interactive components.	**Non Examined Assessment**
Term 2:2	**Unit 15 Learning Aim C** **(Develop a website to meet client requirements)** > Client-side scripting languages > Website development > Website review > Website optimisation > Skills, knowledge and behaviours	We then move onto learning aim C. In this students will use procedural knowledge to construct the website they designed in learning aim B. This is split up into elements such as CSS, Java Script/user forms, client side processing. They will also show how they can host the website for the client.	**Non Examined Assessment**
Term 3:1			
Term 3:2			