Long Term Plan GCSE Computer Science Y10

OCR Level 1/Level 2 GCSE (9-1) in Computer Science

QN 601/8355/X, Subject code J277, Paper code J277/01 and J277/02

Half term	Unit title	Key knowledge/ Content to learn and retain	Essential skills to acquire (subject & generic)	Link to subject ethos and driver	Anticipated misconceptions	Links to previous KS	Links to future KS	Opportunity for stretch for high prior attainers	SMSC & British Values	Cultural Capital	Career Link
HT1	1.1 Systems architecture	**Introduction to the course** **1.1.1 Architecture of the CPU** The purpose of the CPU: -The fetch-execute cycle Common CPU components and their function: -ALU (Arithmetic Logic Unit) -CU (Control Unit) -Cache -Registers Von Neumann architecture: -MAR (Memory Address Register) -MDR (Memory Data Register)	AO1: Demonstrate knowledge and understanding of the key concepts and principles of Computer Science AO2: Apply knowledge and understanding of key concepts and principles of Computer Science AO3: Analyse problems in computationa	Learners are happy and demonstrate a hunger for learning and have the courage to attempt new tasks and complete current ones. Misconceptions are corrected and challenged at an appropriate level. Inclusive environment in which all	How to measure CPU performance Differences between primary and secondary storage, and different types of storage devices.	At KS3 the students will have covered some programming including using Python and Scratch. They will also have limited knowledge of the CPU as the 'brain of the computer' and may have covered briefly the fetch-execute cycle.	Links to: AS Level Computer Science A Level Computer Science Cambridge Technicals IT Level 2 and 3	Challenge and extension tasks will be inbuilt into all lessons. The practical programming elements will have open ended solutions for students to work on their skills.	Although there are no specific curriculum links here, in all lessons the students will experience a culture of mutual respect and equality. Classrooms are a safe environment and individual tolerance and respect are paramount.	Students are encouraged to read around the topics in newspapers and to use news apps. Where appropriate real-life examples will be brought into the classroom. The practical programming elements will allow the solutions to be created to 'real-world'	Links to roles involving computer hardware, such a computer technician.

		-Program Counter -Accumulator **1.1.2 CPU Performance** How common characteristics of CPUs affect their performance: -Clock speed -Cache size -Number of cores **1.1.3 Embedded systems** The purpose and characteristics of embedded systems Examples of embedded systems **Practical Programming Skills (Basic)**	l terms: - to make reasoned judgements - to design, program, evaluate and refine solutions	learners can thrive and make excellent progress. Learners are given tools and encouraged to be inquisitive, resilient, independent and to be able to apply their learning and skills to 'real world' situations.		They will have covered storage devices, including the difference between primary and secondary storage, but again only at a basic level.				problems.	
HT2	1.2 Memory and storage	**1.1 Assessment** **1.2.1 Primary storage (memory)** The need for primary storage The difference between RAM and ROM The purpose of ROM in a computer system The purpose of RAM in a computer system Virtual memory **1.2.2 Secondary**	AO1: Demonstrate knowledge and understandin g of the key concepts and principles of Computer Science AO2: Apply knowledge and understandin g of key concepts and principles of Computer Science	Learners are happy and demonstrate a hunger for learning and have the courage to attempt new tasks and complete current ones. Misconcepti ons are corrected and challenged at an appropriate	Conversions between different units of data. Calculations working out storage size of numbers, characters, images and sound.	At KS3 students have studied the different measuremen ts, although the term 'nibble' is new to them.	Links to: AS Level Computer Science A Level Computer Science Cambridge Technicals IT Level 2 and 3	Challenge and extension tasks will be inbuilt into all lessons. The practical programming elements will have open ended solutions for students to work on their skills.	Although there are no specific curriculum links here, in all lessons the students will experience a culture of mutual respect and equality. Classrooms are a safe environment and individual tolerance	Students are encouraged to read around the topics in newspapers and to use news apps. Where appropriate real-life examples will be brought into the classroom. The practical programming	Links to roles involving computer hardware, such a computer technician.

		storage The need for secondary storage Common types of storage: -Optical -Magnetic -Solid state Suitable storage devices and storage media for a given application. The advantages and disadvantages of different storage devices and storage media relating to these characteristics. -Capacity -Speed -Portability -Durability -Reliability -Cost **1.2.3 Units** The units of data storage: -Bit -Nibble (4 bits) -Byte (8 bits) -Kilobyte (1,000 bytes or 1KB) -Megabyte (1,000 KB) -Gigabyte (1,000 MB) -Terabyte (1,000 GB) -Petabyte (1,000 TB) How data needs to be converted into a binary format to be processed	AO3: Analyse problems in computational terms: - to make reasoned judgements - to design, program, evaluate and refine solutions	level. Inclusive environment in which all learners can thrive and make excellent progress. Learners are given tools and encouraged to be inquisitive, resilient, independent and to be able to apply their learning and skills to 'real world' situations.					and respect are paramount.	elements will allow the solutions to be created to 'real-world' problems.	

		by a computer. Data capacity and calculation of data capacity requirements. **1.2.4 Data storage** <u>Numbers</u> How to convert positive denary whole numbers to binary numbers (up to and including 8 bits) and vice versa. How to add two binary integers together (up to and including 8 bits) and explain overflow errors which may occur. How to convert positive denary whole numbers into 2-digit hexadecimal numbers and vice versa. How to convert binary integers to their hexadecimal equivalents and vice versa. Binary shifts. <u>Characters</u> The use of binary codes to represent characters. The term ‘character set’ The relationship between the number of bits per character in a character set, and the number of characters which can be									

		represented, e.g: -ASCII -Unicode									
HT3	1.2 Memory and storage	<u>Images</u> How an image is represented as a series of pixels, represented in binary. Metadata. The effect of colour depth and resolution on: -The quality of an image -The size of an image file <u>Sound</u> How sound can be sampled and stored in a digital form The effect of sample rate, duration and bit depth on: -The playback quality -The size of the sound file **1.2.5 Compression** The need for compression Types of compression -Lossy -Lossless **Practical programming skills**	AO1: Demonstrate knowledge and understanding of the key concepts and principles of Computer Science AO2: Apply knowledge and understanding of key concepts and principles of Computer Science AO3: Analyse problems in computational terms: - to make reasoned judgements - to design, program, evaluate and refine solutions	Learners are happy and demonstrate a hunger for learning and have the courage to attempt new tasks and complete current ones. Misconceptions are corrected and challenged at an appropriate level. Inclusive environment in which all learners can thrive and make excellent progress. Learners are given tools and encouraged to be inquisitive, resilient, independent and to be able to apply	There may be misconceptions about the different types of networks and which devices are needed to connect, e.g.to the Internet. Some students may be unclear on how a wireless network works.	In Y8 the students will have briefly covered some of the network types and also some of the hardware needed for connecting networks.	Links to: AS Level Computer Science A Level Computer Science Cambridge Technicals IT Level 2 and 3	Challenge and extension tasks will be inbuilt into all lessons. The practical programming elements will have open ended solutions for students to work on their skills.	Although there are no specific curriculum links here, in all lessons the students will experience a culture of mutual respect and equality. Classrooms are a safe environment and individual tolerance and respect are paramount.	Students are encouraged to read around the topics in newspapers and to use news apps. Where appropriate real-life examples will be brought into the classroom. The practical programming elements will allow the solutions to be created to ‘real-world’ problems.	Links to roles involving computer hardware, such a computer technician.

	1.3 Computer networks, connections and protocols	**1.3.1 Networks and topologies** Types of network: -LAN (Local Area Network) -WAN (Wide Area Network) Factors that affect the performance of networks The different roles of computers in a client-server and a peer-to-peer network. The hardware needed to connect stand-alone computers into a Local Area Network: -Wireless access points -Routers -Switches -NIC (Network Interface Controller/Card) Transmission media The internet as a worldwide collection of computer networks: -DNS (Domain Name Server) -Hosting -The Cloud -Web servers and clients Star and Mesh network topologies. **1.3.2 Wired and wireless networks, protocols and layers** Methods of connection:		their learning and skills to 'real world' situations.							

		-Wired - Ethernet -Wireless -Wi-Fi -Bluetooth **Practical programming skills**									
HT4	1.3 Computer networks, connections and protocols 1.4 Network security	**1.3.2 Wired and wireless networks, protocols and layers** Encryption IP addressing and MAC addressing Standards Common protocols including: -TCP/IP (Transmission Control Protocol/Internet Protocol) -HTTP (HyperText Transfer Protocol) -HTTPS (HyperText Transfer Protocol Secure) -FTP (File Transfer Protocol) -POP (Post Office Protocol) -IMAP (Instant Message Access Protocol) -SMTP (Simple Mail Transfer Protocol) The concept of layers **1.4.1 Threats to computer systems and networks** Forms of attack: -Malware	AO1: Demonstrate knowledge and understanding of the key concepts and principles of Computer Science AO2: Apply knowledge and understanding of key concepts and principles of Computer Science AO3: Analyse problems in computational terms: - to make reasoned judgements - to design, program, evaluate and refine solutions	Learners are happy and demonstrate a hunger for learning and have the courage to attempt new tasks and complete current ones. Misconceptions are corrected and challenged at an appropriate level. Inclusive environment in which all learners can thrive and make excellent progress. Learners are given tools and encouraged to be inquisitive, resilient,	The different acronyms and what they stand for for the protocols. Protection methods - e.g. students often mix up firewalls and anti-malware software.	At KS3 students will have studied the terms encryption and decryption, and will also have looked at some of the threats to computer systems, and some of the methods of protecting a computer network against these.	Links to: AS Level Computer Science A Level Computer Science Cambridge Technicals IT Level 2 and 3	Challenge and extension tasks will be inbuilt into all lessons. The practical programming elements will have open ended solutions for students to work on their skills.	The rule of law will be taught with regards to the main laws governing computing, such as the Computer Misuse Act (1990). In all lessons the students will experience a culture of mutual respect and equality. Classrooms are a safe environment and individual tolerance and respect are paramount.	Students are encouraged to read around the topics in newspapers and to use news apps. Where appropriate real-life examples will be brought into the classroom. The practical programming elements will allow the solutions to be created to ‘real-world’ problems.	Links to roles involving computer hardware, such a computer technician.

		-Social engineering, e.g. phishing, people as the 'weak point' -Brute force attacks -Denial of service attacks -Data interception and theft -The concept of SQL injection **1.4.2 Identifying and preventing vulnerabilities** Common prevention methods: -Penetration testing -Anti-malware software -Firewalls -User access levels -Passwords -Encryption -Physical security **Practical programming skills**		independent and to be able to apply their learning and skills to 'real world' situations.							
HT5	1.5 Systems software	**1.5.1 Operating systems** The purpose and functionality of operating systems: -User interface -Memory management and multitasking -Peripheral management and drivers -User management -File management **1.5.2 Utility software** The purpose and functionality of utility	AO1: Demonstrate knowledge and understanding of the key concepts and principles of Computer Science AO2: Apply knowledge and understanding of key concepts and principles of Computer	Learners are happy and demonstrate a hunger for learning and have the courage to attempt new tasks and complete current ones. Misconceptions are corrected and challenged at an	The purpose of different types of software.	At KS3 students will have used a user interface in their IT lessons. They will have awareness of some different types of software.	Links to: AS Level Computer Science A Level Computer Science Cambridge Technicals IT Level 2 and 3	Challenge and extension tasks will be inbuilt into all lessons. The practical programming elements will have open ended solutions for students to work on their skills.	Although there are no specific curriculum links here, in all lessons the students will experience a culture of mutual respect and equality. Classrooms are a safe environment and individual	Students are encouraged to read around the topics in newspapers and to use news apps. Where appropriate real-life examples will be brought into the classroom. The practical	Links to roles involving computer hardware, such a computer technician. Also links to software developer roles too.

		software Utility system software: -Encryption software -Defragmentation -Data compression **Practical programming skills**	Science AO3: Analyse problems in computational terms: - to make reasoned judgements - to design, program, evaluate and refine solutions	appropriate level. Inclusive environment in which all learners can thrive and make excellent progress. Learners are given tools and encouraged to be inquisitive, resilient, independent and to be able to apply their learning and skills to 'real world' situations.					tolerance and respect are paramount.	programming elements will allow the solutions to be created to 'real-world' problems.	
HT6	1.6 Ethical, legal, cultural and environmental impacts of digital technology	**1.6.1 Ethical, legal, cultural and environmental impact** Impacts of digital technology on wider society including: -Ethical issues -Legal issues -Cultural issues -Environmental issues -Privacy issues Legislation relevant to Computer Science: -The Data Protection Act 2018 -Computer Misuse Act	AO1: Demonstrate knowledge and understanding of the key concepts and principles of Computer Science AO2: Apply knowledge and understanding of key concepts and principles of Computer	Learners are happy and demonstrate a hunger for learning and have the courage to attempt new tasks and complete current ones. Misconceptions are corrected and challenged at an	The different types of software licences. The different 'real world' issues surrounding computing.	At KS3 the students will have discussed some of the legal issues surrounding computing.	Links to: AS Level Computer Science A Level Computer Science Cambridge Technicals IT Level 2 and 3	Challenge and extension tasks will be inbuilt into all lessons. The practical programming elements will have open ended solutions for students to work on their skills.	Focus very much on SMSC, including ethical, legal, cultural, environmental, and privacy issues to do with Computing.	Students are encouraged to read around the topics in newspapers and to use news apps. Where appropriate real-life examples will be brought into the classroom. The practical	Links to roles involving computer hardware, such a computer technician. Also roles such as software developers.

		1990 -Copyright Designs and Patents Act 1998 -Software licences (i.e. open source and proprietary)	Science AO3: Analyse problems in computational terms: - to make reasoned judgements - to design, program, evaluate and refine solutions	appropriate level. Inclusive environment in which all learners can thrive and make excellent progress. Learners are given tools and encouraged to be inquisitive, resilient, independent and to be able to apply their learning and skills to 'real world' situations.						programming elements will allow the solutions to be created to 'real-world' problems.	

Aims and Learning Outcomes

OCR's GCSE (9-1) in Computer Science will encourage students to:

- Understand and apply the fundamental principles and concepts of Computer Science, including abstraction, decomposition, logic, algorithms and data representation
- Analyse problems in computational terms through practical experience of solving such problems, including designing, writing and debugging programs
- Think creatively, innovatively, analytically, logically and critically
- Understand the components that make up digital systems, and how they communicate with one another and with other systems
- Understand the impacts of digital technology to the individual and to wider society
- Apply mathematical skills relevant to Computer Science.

Skills developed throughout the programme

Cognitive skills
● Non-routine problem solving – expert thinking, metacognition, creativity.
● Systems thinking – decision making and reasoning.
● Critical thinking – definitions of critical thinking are broad and usually involve general cognitive skills such as analysing, synthesising and reasoning skills.
● ICT literacy – access, manage, integrate, evaluate, construct and communicate.

Interpersonal skills
● Communication – active listening, oral communication, written communication, assertive communication and non-verbal communication.
● Relationship-building skills – teamwork, trust, intercultural sensitivity, service orientation, self-presentation, social influence, conflict resolution and negotiation.
● Collaborative problem solving – establishing and maintaining shared understanding, taking appropriate action, establishing and maintaining team organisation.

Intrapersonal skills
● Adaptability – ability and willingness to cope with the uncertain, handling work stress, adapting to different personalities, communication styles and cultures, and physical adaptability to various indoor and outdoor work environments.
● Self-management and self-development – ability to work remotely in virtual teams, work autonomously, be self-motivating and self-monitoring, willing and able to acquire new information and skills related to work.