SCARBOROUGH UTC
Technical Excellence, Employable Graduates

Long Term Plan Year 10 OCR J727 Computer Science

Half Term	Unit Title & description	Key Knowledge & Content to learn and retain	Essential Skills to acquire (subject & generic)	Link to intent and ethos	Anticipated misconceptions	Links to previous KS3	Link to future KS4 & KS5	Opportunity for stretch and high prior attainers	SMSC & British Values	Cultural Capital	Career Link
One	1.1 Systems architecture 1.2 Memory & Storage Part 1	• Understand the functionality and purpose of the CPU • Know the components and registers of the CPU. • Know the stages of the fetch, decode & execute cycle. • Know what factors affect the speed of a CPU. • Know what is meant by the term: 'embedded system'. • Know the difference and purpose between RAM and ROM. • Understand the need for virtual memory • Understand the need for secondary storage. • Know the common types of storage. • Know the characteristics of storage devices. • Understand the suitability of storage devices for given applications with justification • Know what data capacity means. • Understand how to calculate data capacity requirements.	Drawing and labelling abstract diagrams. Technical processes Extended writing Develop a line of enquiry based on observation and provide recommendations with justification Calculate data capacity Evaluate benefits and drawbacks	Learners will develop knowledge and understanding of technical content in this unit through computational approaches by using essential skills they will be able to logically think about how a CPU processes data, how data is stored in different memory and storage components whilst concurrently thinking how all these components function together.	• When comparing CPU speeds, learners need to think about clock speed, cache size and number of cores. Just because one is larger/faster does not mean it is faster • Embedded systems are usually pre-programmed and stored in ROM. • Virtual memory refers to space on a secondary storage device to store temporary data (e.g. to cope when RAM is full) • Avoid general statements like "Flash memory is better". Most questions will ask to compare different storage devices and why one is better or worse than another • Remember that the scenario in storage questions will affect how to compare storage devices	KS3 prepares learners for KS4 through developing an understanding of what a computer is, the difference between hardware and software, and to be able to state the components of the CPU which further links to data capacity measurements and computer speed.	Learners will develop an understanding of future topics such as programming, Binary, and networking. Learners will benefit from knowing how memory and storage work when beginning the practical elements of the course such as how algorithms are created, stored and executed by the CPU. This in turn leads to a deeper understanding that data is stored and communicated in a computer using the Binary number system. In networking learners will benefit from knowing computer components and their functionality before understanding how they are networked together.	Learners are encouraged to learn how the CPU fetches, decodes and executes through simulation software 'The Little Man Computer'. This enables learners to develop an understanding of how the CPU works visually and at a much deeper level whilst introducing learners to assembly programming language.	Learners will have opportunities to think and discuss how memory has evolved in computer systems over time. Influential people involved from 16th century to present day. Computer component manufacturers leading in processor architecture. How government agencies (GCHQ, Police, NHS, and Council) store data, what kind of data, is this moral? The laws surrounding data; private and public data and copyright. Impacts on storage space and how this impacts on the environment and society.	Learners will have the opportunity to think and discuss the topic on 'Big Data' ; issues relating to how enormous amounts of data is stored which in turn relates to mainframe computers and quantum computers. Further concerning issues are discussed such as misinformation (information warfare), and social media and the impacts this has on society	https://www.gchq-careers.co.uk/ https://www.mi5.gov.uk/careers https://www.sis.gov.uk/explore-careers.html https://www.yhrocu.org.uk/vacancies/ https://nationalcrimeagency.gov.uk/careers/vacancies Cyber First Courses
Two	1.2 Data Representation PART 2	• Understand what is meant by the terms bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte and petabyte. • Know how to convert between denary, binary, and hexadecimal and vice versa. • Understand that data needs to be converted into a binary format to be processed by a computer. • Know how to calculate binary addition, and binary left and right shifts. • Understand how to calculate a image and sound file using binary • Understand the process of two compression methods.	Technical processes of lossless data compression Calculate between data units Calculate binary addition Calculate binary shifts Calculate an image file Calculate a sound file	Learners will develop knowledge and understanding of mathematical content in this unit through computational approaches by using essential skills they will be able to solve different types of problems.	Binary numbers do not always have 8-digits! 11010 is the same number as 0001 1010 • Align your numbers to the RIGHT when adding binary numbers of different 'lengths': 1100 0011 + NOT 1100 0011 + 1 1001 1100 1 • You can use either 1024 or 1000 in your calculations – both will be accepted • Compression does not allow you to send data "faster". That depends on your internet connection! You can send more compressed data in the same amount of time as uncompressed data if transmitting at the same speed.	KS3 prepares learners for KS4 through developing an understanding of number systems such as denary and binary. Learners should have developed a sound basis of binary and binary addition. Learners should know common Boolean logic gates and their logic.	Learners will develop an understanding of future topics such as Algorithms, Boolean algebra and programming; this will provide clarity on why all files need to be converted to binary so the computer can execute instructions, moreover why some data are formatted in hexadecimal such as MAC address and colour codes e.g. #0045AFEB	Learners are encouraged to practise A Level tasks: - converting between: -denary to binary, and vice versa -denary to hexadecimal and vice versa -Binary to hexadecimal and vice versa -Learners are encouraged to complete A Level tasks such as converting negative numbers and learning dictionary encoding for a method of compression	Learners will have the opportunity to discuss wider implications of compression and how it is linked to cryptography. - Cryptography is used to keep our communications safe but criminals can also use it for this purpose too, to evade law enforcement agencies interception ; how might encryption be perceived through different ethical lenses?	Learners will have the opportunity to discuss wider issues surrounding compression and number systems: -The origins of theoretical compression is provided by information theory which is an area of study created by Claude Shannon who published papers on the subject in the 1940s. The Essential Message: Claude Shannon and the making of Information Theory	Women in Tech roles

Three	1.3.1 Computer networks, communications and protocols	•Types of network: LAN and WAN • Factors that affect the performance of networks. • Different roles of computers in a client-server and peer-to-peer network •Hardware needed to connect stand-alone computers into a LAN: -Wireless Access Point -Routers -Switches -NIC -Transmission Media •The Internet as a whole collection of computer networks: -DNS -Hosting -The cloud -Web servers and clients •Star and mesh topologies •Modes of connection •Encryption •IP Addressing and MAC addressing •Common protocols •Concept of layers	Drawing and labelling abstract diagrams. Technical processes Extended writing Develop a line of enquiry based on observation and provide recommendations with justification Evaluate benefits and drawbacks	Learners will develop knowledge and understanding of different types of networks, topologies, protocols and layers using computational methods such as thinking ahead.	Virtual networks are created by software and wireless technology. Be clear on the differences between virtual storage and virtual networks, they are different. Be clear about the differences between POP, IMAP and SMTP protocols. They are all to do with sending mail – but are slightly different. There is not a need to know what each network layer is called. Just why layers are useful in networks, and why we use them.	KS3 prepares learners for KS4 through developing an understanding of what a standalone computer is to defining a computer network. Learners should know common hardware components and devices that make up a computer and how a computer communicates through common devices.	Learners will develop knowledge and understanding of future topics such as network security, Systems software, and Ethics; - why computer networks and data need to be protected which is linked to the previous topic, 1.2 Data representation. -Systems software is linked to operating systems and how they can be exploited without the correct preventative measures, thus the need for updated software installed on network devices. -Protocols are linked to ethical hacking or to simulate a penetration test linked to topic 1.4 network security - The Internet is linked to Ethical, Legal, cultural, and environmental issues 1.6.	Learners are encouraged to learn and explore network simulation software to be able to: - visually design many types of networks and topologies using CISCO packet tracer to simulate how data packets transmit over a network and the implementation of protocols. This in turn enhances higher level thinking of how VLANs/subnets are created. - create a virtual network, e.g. a client -server network and configure the server to create group policies and users to the network. using VMWare or Virtual Box.	Learners will have opportunities to explore legislation surrounding the Internet in the UK and globally. -Internet services in other countries – why do certain countries limit access to the internet and what impact does this have on society; is this moral? -What impact does the Internet have on society regarding social media?	Learners will have the opportunity to think and discuss issues surrounding the Internet: - Who owns the Internet? -Origins of the Internet -Difference between the Internet and the World Wide Web -Sir Tim Berners Lee founder of WWW -Future trends of the Internet and IoT	IT Service Manager Service Desk Analyst IT Technician NHS IT Roles Police IT Roles
Four	1.4 Network security	•Threats to computer systems: Forms of attack: -Malware -Social engineering -Brute force -Denial of service -Data interception and theft -SQL Injection •Identifying and preventing vulnerabilities: Common prevention methods; -Penetration testing -Anti-malware software -Firewalls -User access levels -Passwords -Encryption -Physical security.	Drawing and labelling abstract diagrams. Technical processes Extended writing Develop a line of enquiry based on observation and provide recommendations with justification Evaluate benefits and drawbacks	Learners will develop knowledge and understanding through computational methods such as thinking procedurally when explaining the process of how different forms of attack function and thinking ahead when explaining different preventative measures to keep computer systems secure.	•Encryption does not stop data theft. Encryption protects the data from being read as easily •It's incorrect to assume that a computer system or network is 100% secure or risk free even with preventative measures in place.	KS3 prepares learners for KS4 through developing an understanding of basic forms of threats posed to networks and individuals. Further basic understanding of some preventative measures.	Learners will develop an understanding of linked topics such as systems software; It is paramount that network and computer security is everyone's responsibility and knowing how to keep your devices free from potential risk of threat with the use of specialised softwares and utility softwares.	Learners are encouraged to research and explore common exploits and hacks in society, e.g. WannaCry ransomware attack Why do exploits happen? What are the reasons for illegal hacking? Are there different types of hackers? What are the impacts of hacking? What is cyberwarfare?	Learners will have opportunities to discuss encryption: -Why is data encrypted? - Rule of law; legislation -Ethical hacking and democracy	Learners will have the opportunity to discuss wider issues surrounding encryption and number systems: -Origin of GCHQ and encryption during WWII and the works of Alan Turing -Original and well known encryption ciphers, e.g. Caesar cipher and the Pig Pen Cipher	Cyber Security Apprenticeship Cyber security Analyst Ethical Hacker Penetration Tester BAE Systems
Five	1.5 Systems Software 1.5.1 Operating Systems 1.5.2 Utility Software	•Purpose and functionality of operating systems: -User interface -memory management -Peripheral management and drivers -User and file management •Purpose and functionality of utility software: -Encryption software -Defragmentation -Data compression	Drawing and labelling abstract diagrams. Technical processes Extended writing Develop a line of enquiry based on observation and provide recommendations with justification Evaluate benefits and drawbacks	Learners will develop knowledge and understanding through computational methods such as thinking procedurally and thinking concurrently when explaining how an operating system manages many tasks simultaneously.	Be clear between utility software and operating systems. Operating systems often come with utility software included. This does not mean that they are the same thing. Be clear that Systems Software are categorised as Systems Software and Applications Software.	KS3 prepares learners for KS4 through developing an understanding of what an operating system is with some knowledge of its roles.	Learners will develop an understanding of future topics such as programming; learners will gain a deeper understanding of why variables are assigned a data type so the computer/ operating system can allocate the right amount of memory at run time.	Learners are encouraged to attempt A Level tasks such as methods used for memory management; paging and segmentation.	Discussion around encryption; some law enforcement agencies view encryption as a tool that makes it harder for them to fulfil their duties. In European countries it is deemed that privacy is a basic human right which encryption protects but it is balanced against other rights such as	Learners will have the opportunity to think and discuss encryption and future trends such as the impacts of IoT (Internet of Things) and IoE (Internet of Everything).	Cyber Security Apprenticeships Ethical Hacker Penetration Tester Platform Analyst

								the right to life and security.		
Six	1.6 Ethical, legal, cultural, environmental impacts on digital technology	•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 1990 -Copyright Designs and Patents Act 1988 -Software licences	Drawing and labelling abstract diagrams. Technical processes Extended writing Develop a line of enquiry based on observation and provide recommendations with justification Calculate data capacity Evaluate benefits and drawbacks	Learners will develop knowledge and understanding through computational methods; thinking logically when discussing ethical, legal, cultural, privacy, and environmental issues.	This unit focuses on the quality of written communication • You will often be asked to write a balanced argument here • Remember questions may ask you for good and bad points • It is always worth spending 5 minutes to plan your answer. This will help you write in a sensible order, and to mention everything you want to.	KS3 prepares learners for KS4 through developing an understanding of legislation such as the Data Protection Act and Computer Misuse Act.	Learners will develop a deeper understanding of the impacts of digital technology on wider society such as The Regulation of Investigatory Powers Act 2000.	Learners are encouraged to discuss and complete tasks at A Level through topics such as: -Computers in the workforce -Automated decision making -Artificial intelligence -Environmental impacts -Censorship and the Internet -Monitor behaviour -Analyse personal information -Piracy and offensive communications	Learners will have opportunities to discuss the individual moral, ethical and cultural opportunities and risks of digital technology:	Learners will have the opportunity to think and discuss developments in digital technologies have enabled massive transformations in the capacity of organisations to monitor behaviour, amass and analyse personal information. -Case studies include: -Edward Snowdon -Cyber Attacks -Google Street View -The destruction of jobs	