GCSE

WJEC GCSE in DIGITAL TECHNOLOGY

APPROVED BY QUALIFICATIONS WALES

UNIT 1 GUIDE

Teaching from 2021

This Qualifications Wales regulated qualification is not available to centres in England.

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Aims of the Guidance for Teaching

The principal aim of the Guidance for Teaching is to support teachers in the delivery of the new **WJEC GCSE Digital Technology** specification and to offer guidance on the requirements of the qualification and the assessment process. The Guidance for Teaching is **not intended as a comprehensive reference**, but as support for professional teachers to develop stimulating and exciting courses tailored to the needs and skills of their own students in their particular institutions.

Aims of the Unit Guides

The principal aim of the Unit Guides is to support teaching and learning and act as a companion to the Specification. Each Unit Guide will offer detailed explanation of key points in the Specification and aim to explain complex areas of subject content. An overview of the whole course can be found in the Delivery Guide.

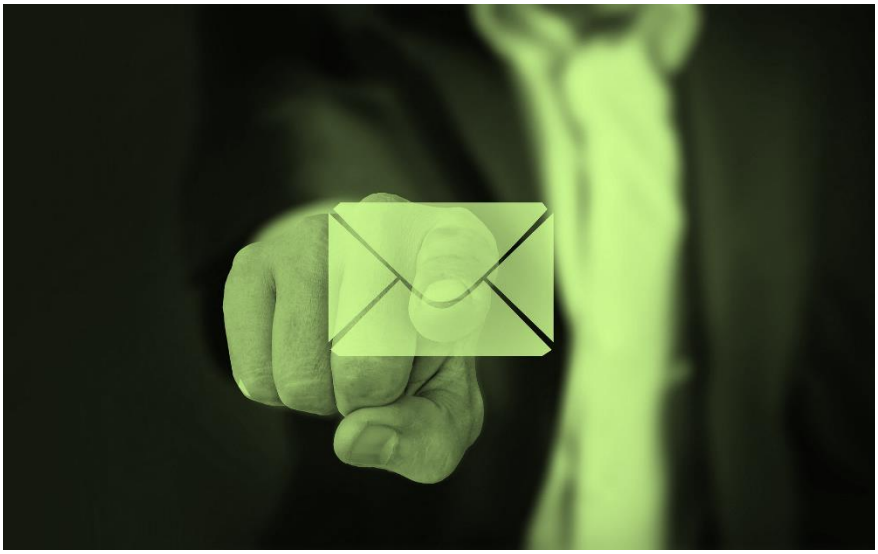


Fig 1.

1. INTRODUCTION

The **WJEC GCSE in Digital Technology** qualification, approved by Qualifications Wales for first teaching from September 2021 is available to:

- all schools and colleges in Wales
- subject to local agreement, it is also available to centres outside Wales, for example in the crown dependencies of the Isle of Man and the Channel Islands, and in British overseas territories, and to British forces schools overseas. It is not available to other overseas centres or in England or Northern Ireland.

It will be awarded for the first time in Summer 2023, using grades A*–G.

1.1 Additional ways that WJEC can offer support:

- sample assessment materials and mark schemes
- exemplar materials for performing and composing
- face-to-face CPD events
- examiners' reports on each question paper
- free access to past question papers and mark schemes via the secure website
- direct access to the subject officer
- free online resources including practice questions and detailed set work notes
- Exam Results Analysis
- Online Examination Review

2. OVERVIEW OF THE SPECIFICATION CONTENT

2.1.1 Data

In this section learners will gain knowledge and understanding of the following:

- analogue and digital data
- measuring and storing data.

Content	Amplification	Teacher Guidance
Analogue and digital data	Learners should understand: • what is meant by analogue data • what is meant by digital data • analogue and digital devices • the relationship between analogue and digital data.	Analogue data is data that's represented in a physical way e.g. grooves in a record, a shadow on a sundial. Digital data uses a pattern of binary numbers that can be interpreted by various technologies. Learners should understand that analogue devices are built to interpret analogue data in a set way e.g. a record player. Digital devices are generally able to interpret a wide variety of digital data, edit it and transform it. Digital data can be less precise and have a lower quality than analogue data but tends to take up less physical space. Analogue data is subject to deterioration. Analogue data uses a continuous range of values to represent information whereas digital data uses discrete or discontinuous values.
	Learners should: • be able to explain the main principles of analogue to digital conversion in relation to recording, sampling and storing sound and light.	To use analogue values with a digital device the data needs to be converted using a converter – ADC or DAC. **Sound:** The digital representation is achieved by sampling (signal processing). The sample quality can be affected by the sample rate and sample frequency. The higher the sample rate and frequency, the larger the resultant sample. The size of the storage requirement will depend on the sample rate, the sample resolution and the length of the sound **Light:** Understand that raster graphics are dot matrix data structures representing a grid of pixels and cannot scale up without loss of apparent quality. They tend to be large in terms of the memory required to store them.

Content	Amplification	Teacher Guidance
		A bitmap image is a type of raster image and is composed of many tiny parts, called pixels, which are often many different colours. It is possible to edit each individual pixel. In a digital camera light falls onto photo receptors arranged as pixels. The resulting data is then stored. The quality of the image is directly related to the number of pixels.

	• understand the advantages and disadvantages of storing data digitally, in relation to the following:
	  • data retrieval
	  • efficiency
	  • security
	  • accessibility
	  • scalability
	  • loss of quality due to sampling
	  • expense
	  • management
		Learners should understand that this is about storing data digitally and not a comparison with e.g. filing cabinets.
		
		The topic should be approached in terms of type of storage, media used, capacity, durability and portability.

	• demonstrate knowledge and understanding of how images are stored digitally in terms of:
	  • pixels
	  • resolution
	  • vector and bitmap graphics
	  • moving image files
	  • compression techniques.
		Pixels are small individual dots that are displayed on a computer monitor. An image is made up of multiple pixels. The quality of the image depends on the number of pixels per inch (PPI) included in the image. The more pixels per inch on the screen, the higher the resolution of the picture.
		
		Resolution is the number of pixels per unit of measurement. It refers to the image quality and an image that has a high resolution allows clear and sharp, realistic images to be stored and viewed. High-resolution images have a large file size and therefore larger processing and loading times.
		
		Vector graphics use geometric primitives such as points, lines, curves, shapes or polygons which are based on mathematical expressions to represent images. Vector graphics can be scaled without the loss of quality. They are smaller than bitmap graphics in terms of the memory required to store them.

Content	Amplification	Teacher Guidance
	•	**A bitmap image** is comprised of many tiny parts, called pixels, which can be many different colours. Each individual pixel can be edited. **Moving image** or video files can be streamed from websites and this allows the file to be processed and viewed before the file has been completely downloaded. Streaming allows the video to download in the background and play in the foreground of the client device. A buffer is a temporary storage area used to hold the downloaded sections of the video that have not yet been played. If the connection gets interrupted, the buffer will go down and will begin buffering whilst it catches up. Understand that **compression** reduces file size in memory terms. Lossy compression results in reduction of data quality. Lossless compression results in no loss of data quality following compression.

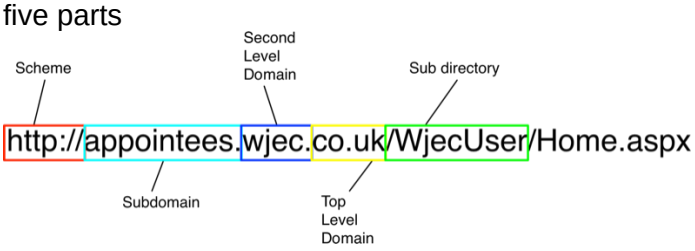
Measuring and storing data	• computer systems can only store and process binary digits
	• describe the relationship between binary data storage units
	• identify the following storage mediums and their application:
	  • magnetic
	  • optical
	  • cloud
	  • solid state.
		Data is represented using one of two different values a 0 or a 1.
		
		Describe the relationship between the following data storage units:
		• Bit – 1 or a 0
		• Nybble – 4 bits or half a byte
		• Byte – 8 bits e.g. 10010011
		• Kilobyte – 1024 bytes
		• Megabyte – 1024 KB
		• Gigabyte – 1024 MB
		• Terabyte – 1024 GB
		• Petabyte – 1024 TB
		
		WJEC will always use powers of 2 to describe data size unless otherwise stated.
		Magnetic storage – disk/tape
		Optical storage – CD/DVD/Blu-ray
		Cloud storage – storing date on the Internet via a provider
		Solid state storage – Flash/SD
		
		Relate secondary storage types to a situation or use such as a student using a USB memory stick to transfer files between school and home or a businessperson using an external hard drive for extra storage or backup purposes.

2.1.2 Digital Technology Systems

In this section learners will gain knowledge and understanding of the following:

- digital devices and means of interaction and connection
- the features of operating systems
- software types and functions
- data backup
- cloud services
- the systems development life cycle.

Content	Amplification	Teacher Guidance
Digital devices and means of: • **interaction** • **connection**	Learners should understand the following ways in which users may interact with digital devices: • speech • traditional keyboard/mouse • gesture • touch • Virtual Reality (VR) • Augmented Reality (AR) • biometrics.	For each of the topics listed. Learners should be able to name and describe devices, interfaces and their related applications as well as the advantages and disadvantages of using them.
	Learners should understand: • that the Internet is a global communications network which uses interconnected computers • the infrastructure of the Internet includes clients, servers and routers • what an Internet Service Provider (ISP) is and the role it plays • how a search engine works • that the World Wide Web (WWW) is a collection of information held on the Internet • how a web server works • the role and structure of Uniform	Learners should know that the Internet is a globally connected network system that facilitates worldwide communication and access to data resources through a vast collection of private, public, business, academic and government networks. A large network of numerous devices. Specialist hardware is used to construct networks, such as: Switches • A switch analyses each packet of data and sends it to the computer it was intended for. Hubs • A hub copies all packets of data to all devices on the network. Routers • A router stores the addresses of computers on the network and transfers data between devices. Clients and Servers

Content	Amplification	Teacher Guidance
	Resource Locators (URL) • how internet browsers request and display websites.	• A server is a piece of computer hardware or software that provides functionality for other programs or devices known as clients. Gateways • A gateway joins together two networks that use different base protocols, e.g. links a LAN to WAN. Bridge • A bridge joins together two networks that use the same base protocols, e.g. links LAN to LAN. An ISP is a company that provides an Internet connection to businesses and households usually for a monthly fee. ISPs can also offer other services such as providing web space and email addresses for clients and provides firewall protection. A search engine is where the user enters a series of key words into a search bar and a web crawler searches around the database of websites (the index) for matching words. The search engine uses algorithms to bring back the best results that include the search terms. The results are ranked into order and the best results are displayed on the user's computer. The World Wide Web or web is an information system where documents and other web resources are identified by Uniform Resource Locators (URLs) which may be interlinked by hypertext and are accessible via the Internet. A Uniform Resource Locator (URL) is a web address which references the location of a web resource and the mechanism for retrieving it. A URL consists of five parts  Internet browsers interpret code downloaded from a web page in order to display it. Learners should understand the process that takes place in order for this to occur.

Content	Amplification	Teacher Guidance
	Learners should be aware of the following connection methods for internet enabled devices, and the advantages and disadvantages associated with each: • broadband • satellite • fibre • mobile communication – 4G/5G • Wi-Fi – 802.11 • Bluetooth • Geographical Information Systems (GIS).	Broadband is an Internet connection method that uses ADSL or SDSL technology. The two main types available are fibre to the cabinet (FTTC) and fibre to the premises (FTTP) (sometimes called fibre to the home). Rather than using the green street cabinet that FTTC uses, FTTP is a full fibre connection and comes directly from the Internet provider. FTTP is the more expensive option, however it is the fastest broadband connection method. A FTTP broadband is faster than standard broadband Fibre optic allows for faster data transfer than traditional copper wires and the connection is more reliable than standard broadband. Satellite Internet connectivity relies on satellites in geo stationary orbit relaying and amplifying signals between different points on Earth. Mobile connectivity allows an Internet connection to be accessed from a device such as a smart phone, tablet or watch using the mobile carriers data bandwidth. Wi-Fi is the more popular name for the 802.11 series of standards. These allow allows wireless data exchange between a device and the Internet at relatively high speed. Bluetooth is a wireless communication standard used over a short range. Geographical Information Systems (GIS) is a satellite based system that allows you to show your position on a map using a computer.
The features of operating systems	Learners should: understand the purpose and function of an operating system.	An operating system manages hardware and software for a computer providing common services for computer programs.
	be able to describe the following features of an operating system: • managing resources • managing peripherals including input and output devices • spooling • managing memory • managing processes • managing security • providing a user interface.	The operating system manages resources, such as: • Manages peripherals such as input and output devices • Manages printing using spooling • Manages backing store • File compression • Disk de-fragmentation • Manages memory (RAM) • Manages processes • Manages security.

Content	Amplification	Teacher Guidance
	understand the uses, advantages and disadvantages of using the following Human Computer Interfaces (HCIs) • Command Line Interface (CLI) • Graphical User Interface (GUI) • Touch Sensitive Interface (TSI) • menu driven interface • biometrics • voice driven interface.	There are many different types of HCI: **CLI** – Users type in commands at a prompt. **GUI** – Users use Windows, Icons, Menus and Pointers. **TSI** – Users press different parts of the screen and use gestures to drive the operating system. **Menu Driven Interface** – users work through a series of menus to execute routines. **Biometrics** – body measurements and calculations related to human characteristics. **Voice driven interface** – recognition and interpretation of speech patterns.
Software types and functions	Learners should: be aware of the following different types of software and their purposes: • applications software • bespoke software written for specific purposes • process control.	**Applications software** – off the shelf software that fulfils a specific purpose e.g. Microsoft Word. **Bespoke software** – software written to perform a task for an individual or a company e.g. an ordering or stock control system. **Process control** – software that manages a process feeding back information from a variety of sources to control the input and output.
	understand the use and purpose of the following utility applications: • task scheduling • antivirus software and functions.	Explain the purpose, use and functionality of the listed utility software.
Data backup	Learners should: understand the importance of backing data up and be able to describe the following processes: • full backup • incremental backup • differential backup • Grandfather - Father - Son (GFS) methodology.	**Full backup** – every single folder and file on a device or network is copied. **Incremental backup** –- copies all files that have been created or changed since the last incremental backup. Requires the last full backup and all the incrementals since to restore. **Differential backup** – all files that have been created or changed since the last full backup are copied. Requires the last full backup and just the one differential backup to restore. **Grandfather – Father – Son (GFS)** – a backup strategy where data is backed up generationally. For example: A full machine backup performed monthly (Grandfather) and held offsite. A full backup done on a weekly basis (Father) and held locally. A daily (or more often) differential backup (Son).

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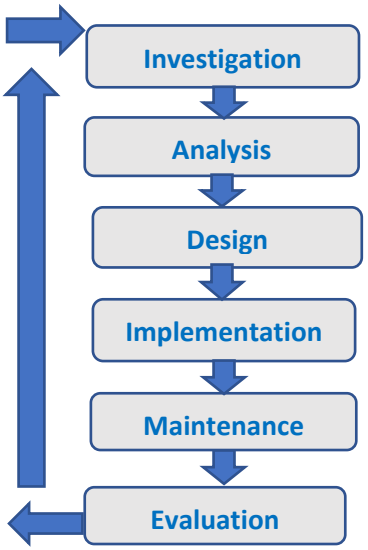
	be able to describe the following media used for backing up data and their suitability in different circumstances: • Universal Serial Bus (USB) flash drive • external hard drive • solid state media • cloud storage.	**USB Flash Drive** –This media uses flash memory and is portable and lightweight. Lower memory capacity than other backup media and can be used to transfer data from device to device. Suitable as a temporary backup. **External Hard Drive** – Hard drives store large amounts of data. They are portable, cheap and are quite efficient. **Solid state media** – uses flash memory to store data. Can hold large amounts of data and are more robust as they have no moving parts. Can be very expensive, has an upper limit to how many times it can be read/written to. **Cloud storage** – storing data and files at a remote location using the Internet. When data is sent to be stored on the cloud, it is sent to a server that is hosted by an external company.
	understand the need for a disaster recovery plan and be able to explain suitable options for recovery.	It is important for companies to have a disaster recovery plan in place for any type of system failures. There can be many different types of disaster that could occur, ranging from a power cut to a natural disaster. A company will need a detailed disaster recovery plan that highlights step by step how the business will recover. It should include details of strategies to deal with primarily the loss of data but also hardware, staff and buildings.
Cloud services	• the difference between cloud computing and cloud storage • the advantages and disadvantages of using cloud services.	**Cloud computing** – the on-demand availability of computer system resources especially storage (cloud storage) and computing power. Describes data centres available to many users over the Internet e.g. AWS. **Cloud storage** – computer data storage available on demand and remotely. **Advantages of Cloud Computing:** • Lower setup costs • Dynamically add more capacity as the system grows. • Compatibility issues are reduced. • Documents and files can be accessed from anywhere that has an Internet connection. • Collaborative working • Reliability

Content	Amplification	Teacher Guidance
		Disadvantages of Cloud Computing: • An Internet connection is required to create, edit save and retrieve files. • Downtime can also be a disadvantage – if the cloud providers are having technical issues, the service cannot be accessed. • Security can be an issue as data stored in the cloud can be vulnerable to hacking. • The cloud version of software is not always the most up to date.
The systems development life cycle	Learners should understand the six parts of the systems development life cycle: • System Investigation • System Analysis • System Design • System Implementation • System Maintenance • System Evaluation	 **System Investigation** The Systems Analyst would investigate the current, existing system and create a feasibility report looking at: • the definition of scope of the current system. • the existing hardware and software. • problems with the existing system • user requirements for the new system. • the cost and benefits of introducing a new system. **System Analysis** • understand what a data flow diagram (DFD) is and be able to interpret one. • understand what a decision table is. • understand what a data dictionary is. **System Design** • Hardware • Software • Network • Staff issues • Security procedures.

Content	Amplification	Teacher Guidance
		System Implementation • Installing the hardware and software • Changeover methods – parallel, direct, pilot and phased methods. **System Maintenance** • User guides • Technical manuals • Error checking. **System Evaluation** • Evaluating the new system e.g. to determine whether the new system meets the initial requirements and needs of the company. How the software can now further evolve is also looked at during this stage.

Fig.2

2.1.3 Digital Communications

In this section learners will gain knowledge and understanding of the following:

- range of digital communication methods for personal, social and business uses
- reliability of online sources
- social networking practices and ownership.

Content	Amplification	Teacher Guidance
Range of digital communication methods for personal, social and business uses	Learners should be aware of: • a range of digital communication methods, their advantages and disadvantages and any associated barriers to communication.	Identify various methods of personal and social digital communication. Understand the advantages and disadvantages associated with them. Understand what would stop you communicating with any specific method.

	• the following types of personal and social communication methods, including the social norms and expected behaviour when using them:
	  • emailing
	  • instant messaging
	  • blogs
	  • video conferencing
	  • social networking websites and apps.
		• Netiquette – for example using capital letters and emojis when communicating in writing would be acceptable on a personal and social level, however not in a work-based environment.
		• Grammar, spelling and the correct use of capitals would also need to be correct on a professional level of written communication.
		• For video calls, many companies expect cameras and microphones to be turned off when there are a large number of employees on a call to reduce background noise levels and only allowing the person speaking at that time to have their camera and microphone on.

	• the following internal and external business communication methods:
	  • video conferencing
	  • teleworking
	  • emailing
	  • promotion
	  • methods
	  • advertising
	  • marketing
	  • websites
	  • apps.
		Learners should know what the main purposes of the listed methods are and what the implications are of using them.

Content	Amplification	Teacher Guidance

Reliability of online sources	• the issues around the reliability of online sources and facts in relation to:
	  • accuracy of information
	  • biased information
	  • out of date information.
		Not all information shared online is **accurate**. For example; Wikipedia can be edited at any time by any user. Facts and opinions on personal blogs, social media and forums can also be inaccurate.
		
		Biased information is also available on the Internet. This is the kind of information written from people's perspective and points of view. A website such as Trip Advisor would be an example of a website that includes biased information.
		
		Out of date information - as information changes over time, old information can sometimes be unreliable.

	• the following methods that verify information found online:
	  • checking multiple sources
	  • using trustworthy websites.
		Checking multiple sources to confirm information found and to ensure a few different sources of information state the same information.
		Using trustworthy and well-known websites can help to ensure the information found online is reliable. Examples here could include BBC News, WJEC and government websites.

Social networking practices and ownership	Learners should understand: • how contemporary social networking platforms work • the benefits and drawbacks of social media • how social networking affects the concept of ownership of media.	Learners should understand the difference between different social media platforms e.g. Facebook, Twitter and Snapchat; who uses them, what they are used for and why. Learners should understand that each platform has its own benefits and drawbacks and that social media as a whole does too. Learners should understand the implications of sharing media on social media sites and the implications for copyright and libel.

2.1.4 Impact of Digital Systems on Organisations and Individuals

In this section learners will gain knowledge and understanding of the following:

- efficiencies and benefits provided by digital systems
- implementation of digital systems
- changing working practices
- changing relationships between producers, manufacturers, distributers and consumers
- rise of services and monetising content.

Content	Amplification	Teacher Guidance
Efficiencies and benefits provided by digital systems	Learners should be aware of the efficiencies and benefits of digital systems and be able to identify benefits and drawbacks of: • office based digital systems for an organisation • consumer digital systems for an individual.	Learners should be aware of the difference between office based and consumer digital systems and where some overlap may occur e.g. word processing. Learners should be able to identify generic benefits and drawbacks applicable to a range of systems.
Implementation of digital systems	Learners should understand the following methodologies for implementing digital systems: • pilot method • parallel method • 'big bang' method.	**Pilot method** – a small scale implementation of a digital system (hardware/software) perhaps in one part of the office with a set of users, one department of an organisation or even one branch. The main benefit of the pilot method is risk reduction and testing – adjustments can be made if necessary, before the full scale roll out. **Parallel method** – introducing the new system and it runs alongside the old system at the same time. Benefits include if there is a problem, users can revert to the old system if necessary and employees can also train and gain confidence with the knowledge the old system is still in place. **The 'big bang' method** – digital system implementation is where a company starts using the new system immediately. This method is cost effective and has a shorter implementation time.

Content	Amplification	Teacher Guidance
Changing working practices	Learners should be aware of the impact that changing working practices have had on culture and society	Learners should be able to describe the benefits and drawbacks of, for example: • increased amount of new job roles in the digital technology sector. • job losses due to new technology • changes in work patterns • collaborative working • teleworking • videoconferencing • the Digital Divide • emerging technologies • the need for retraining and upskilling.
Changing relationships between producers, manufacturers, distributers and consumers	Learners should be aware of the advantages and disadvantages to both customers and businesses of: • Business to Business (B2B) Electronic Data Interchange (EDI) • online shopping • online marketplaces which process 3rd party Business to Consumer (B2C) or Consumer to Consumer (C2C) sales. • B2B buying and selling.	B2B – businesses selling services and products to other businesses. EDI – the paperless electronic interchange of business documents between companies in a standard format. B2C – Businesses selling services and products to consumers. to consumers. C2C – Consumer to consumer selling.
Rise of services and monetising content	Learners should be aware of • marketing to prospective and existing customer by e-mail, social media or other means • advertising through websites • data mining and analytics.	**Email marketing** can be used to target existing and potential new customers with special offers. **Social media** can have targeted adverts for users. Celebrities also use social media for product promotion. **Data mining** is where companies analyse large amounts of data, they hold about their customers to predict trends.

2.1.5 Securing Data and Systems

In this section learners will gain knowledge and understanding of the following:

- the range of threats to data
- the range of cyber security resilience controls
- digital footprints
- legal and ethical responsibilities, including privacy and trust.

Content	Amplification	Teacher Guidance

The range of threats to data	Learners should understand:
	• the following threats to data stored on computer systems and online:
	  • accidental damage – identifying how data can be at risk from accidental destruction
	  • malicious and deliberate damage
		Accidental damage including:
		• accidentally overwriting a file or deleting a folder.
		• leaving a laptop on a train.
		• natural disasters e.g. flooding and fire.
		
		Malicious and deliberate damage including:
		• a disgruntled employee deleting data on purpose.
		• viruses
		a computer program designed to copy itself repeatedly and attach itself to other computer programs.
		• Malware
		Short for malicious software, malware is a broad spectrum term used to describe software used to disrupt computer operation.
		• Phishing
		Fraud where an internet user is tricked (an email message is common) into revealing personal or confidential information
		• Social Engineering
		Psychological manipulation of people into revealing personal or confidential information
		• Brute force attacks
		Repeatedly trying combinations of characters in usernames and passwords in order to gain access to a computer system.
		• Denial of service attacks
		• Prevention of access to systems usually by repeatedly sending huge amounts of messages asking a network or server to

Content	Amplification	Teacher Guidance
		authenticate a request that has no valid return address. • Data Interception and theft/Hacking • Unauthorised taking or interception of computer based information.

	• how networks, systems, transmitted and stored data can be protected using the following security measures:
	  • encryption
	  • firewalls
	  • antivirus software
	  • hierarchical access levels.
		Security measures including:
		• Encryption
		Encoding data either symmetrically or asymmetrically in order to prevent access to the information.
		• Firewalls
		Network security system that monitors incoming and outgoing traffic based on pre-determined rules.
		• Antivirus software
		Anti-virus, spyware, ransomware and malicious website detection software.
		• Hierarchical access levels
		Assigning different levels of system access to users depending on their role.

The range of cyber resilience controls	Learners should understand:
	• cyber resilience as being a company's ability to prepare, survive, respond to and recover from a cyber attack
	• the potential consequences to a company of a cyber attack:
	  • temporary or permanent loss of data and information
	  • damaged or corrupted software
	  • websites taken down
	  • loss of reputation
	  • loss of competitive advantage
	  • financial loss.
		Learners should understand the terminology surrounding cyber resilience as well as understanding the consequences of a lack of cyber resilience.

Content	Amplification	Teacher Guidance

	• the following resilience controls a company may use to prevent a cyber attack:
	  • using a boundary firewall and internet gateway
	  • having secure system configuration including admin accounts, audit trails, account management and backup
	  • implementing access control including restricted access to valuable data
	  • implementing malware protection
	  • having patch management to ensure the latest updates of software are applied to all machines
	  • ensuring known vulnerabilities are dealt with and the latest version of an application is being used
	  • implementing staff training to ensure staff are not putting data at risk.
		Learners should understand how the controls would work, which ones are most appropriate for any given situation and the consequences of both using and not using them.

	• the following resilience controls a company could use to recover from a cyber attack:
	  • having arrangements for the use of alternative premises, communication methods and facilities
	  • exploring various what-if scenarios
	  • ensuring regular backups of data.
		Learners should understand the basics of disaster recovery, what makes a good disaster recovery plan as well as planning for disaster and planning to mitigate disaster.

Content	Amplification	Teacher Guidance
Digital footprints	Learners should understand the term digital footprint and that the following are different types of digital footprint: • a passive digital footprint – data collected without a user's knowledge • an active digital footprint – data intentionally submitted online via blogs, apps, websites and social media actions.	A **passive digital footprint** is data collected without the user's knowledge. It is a data trail unintentionally left online. Examples of how data is collected include a web server storing a user's IP address, a user's search history data. An **active digital footprint** is data intentionally submitted e.g. sharing locations on apps, online shopping data and sending emails and instant messages.
	Learners should be aware of the potential impact of a digital footprint being used by: • employers to monitor employees or potential employees • security services to gather information • applications to target potential customers.	Social media is one major example whereby employers can monitor their employees or potential employee's online activity. A user's digital footprint can also be used by the police or government to gather information.
Legal and ethical responsibilities, including: **privacy** **trust**	Learners should be aware of the basic principles and what constitutes a breach of the following legislation relating to the use of computers, data and electronic communications and their impact on privacy and trust: • The Data Protection Act 2018 including the General Data Protection Regulation (GDPR) • The Computer Misuse Act 1990 • The Investigatory Powers Act 2016.	An understanding of the basic principles, the intent of the legislation and the penalties for breaking the law.
	Learners should be aware of the ethical impact of the widescale use of data and systems on: • individual privacy • wider society.	Learners should be able to discuss the ethics of using data and systems in relation to the privacy of users and wider society.

2.1.6 Changing digital technologies

In this section learners will gain knowledge and understanding of the following:

- key milestones, including the contributions of individuals, in the development of communications, computing systems and digital devices
- the evolution of industrial and autonomous robotics, autonomous vehicles, virtual and augmented reality, artificial intelligence and machine learning, and internet-enabled hardware
- noteworthy research on new and emerging trends, future developments and drivers.

Content	Amplification	Teacher Guidance

Key milestones, including the contributions of individuals, in the development of communications, computing systems and digital devices	Learners should be aware of the following individuals and their key contribution to IT:
	• Lady Ada Lovelace
	  • the first computer programmer, the first person to realise computers could do more than just calculate numbers
	• James Gosling
	  • developed the Java programming language
	• Admiral Grace Hopper
	  • devised the first commercial electronic computer
	• Alan Turing
	  • developed computational theory upon which modern computing is based
	• Steve Jobs
	  • commoditised computing, and developed smartphones and hand-held devices
	• Sir Tim Berners-Lee.
	  • inventor of the World Wide Web.
		Be aware of the key individuals that contributed to the history of the development of communications, computing systems and digital devices.

Content	Amplification	Teacher Guidance
The evolution of: • **industrial and autonomous robotics** • **autonomous vehicles** • **virtual and augmented reality** • **artificial intelligence and machine learning** • **internet-enabled hardware**	Learners should be aware of the main impacts on society, the economy and culture of the following developments in digital technology that have evolved over time: • industrial robots • autonomous robots • autonomous vehicles • virtual reality • augmented reality • Artificial Intelligence (AI) • machine learning • internet-enabled hardware including the Internet of Things (IOT).	Discuss devices, uses, benefits and drawbacks of each of the listed developments in digital technology.
Noteworthy research on new and emerging trends, future developments and drivers	Learners should be aware of the main impacts on society, the economy and culture that new and emerging technology, trends and future developments and drivers in the digital technology world may have.	Learners should research and be able to discuss emerging technology, trends and future developments and drivers in the digital technology world.

Fig.3

3. WJEC RESOURCES

Resources available on the WJEC website: **WJEC GCSE Digital Technology website**

GCSE Digital Technology Specification

Sample Assessment Materials (online version)

Sample Assessment Materials (paper version)

Guidance for Teaching resources

WJEC Online Exam Review: **WJEC OER website**

4. IMPORTANT DATES

First Teaching of GCSE Digital Technology	September 2021
First Entries for GCSE Digital Technology	February 2023
First Examination for GCSE Digital Technology	May/June 2023
First Submission of NEA for units 2 and 3	May 2023
First Resit for GCSE Digital Technology	May/June 2024
First Certification	August 2023

5. KEY CONTACTS

Contact our specialist Subject Officer and administrative support team for digital technology with any queries:

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Tel: 029 22404267

Acknowledgements

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