-HALF TERM 1: User interface design **(A1)**

Component 1: Exploring User interface Design Principles and project Planning Techniques

KQ1: What is a user interface?
- Definition of user interface:
o Where a user and a computer system interact e.g. Siri, automatic doors, GUI's
- Software features
o This is what the user will see or hear such as menus where a user will select an option to change the brightness of the screen or to change the font style
- Human features
o Users may have different needs e.g. accessibility needs were some users may have visual needs and need parts of the interface enlarged
- How software features can be used to facilitate human-device interaction
o Humans and devices obviously work in different was, so careful planning needs to go into designing how the two will interact and al needs and features needs to be considered.

KQ2: What are the different types of user interface?
- Command line interface
o Text based interface is where commands are entered for the system to do something e.g. python
- GUI/WIMPs
o Graphical user interfaces allow users to interact with devices through icons and other visual elements e.g. PC and games consoles
- Sensors
o These are interfaces which output a signal once a signal is inputted e.g. automatic doors
- Menu/Forms
o A menu interface is a way of selecting options by clicking on a graphic on the device screen e.g. ATM machine, settings on a device
- Speech interface
o Software interface that needs either human speech or simulated human speech e.g. Siri, Amazon Alexa

KQ3: What are user interfaces used on?
- Computers
o These are general computers that are used within the workplace or home e.g. laptop and desktop computers
- Handheld devices
o These are small devices that are usually portable e.g. digital watch, smart phones
- Entertainment systems
o These are devices that are often used in the home for leisure activities e.g. games consoles, home cinema systems
- Domestic appliances
o These are devices that are used to complete household tasks e.g. washing machines, microwave ovens
- Controlling devices
o These are devices that are used to control other devices automatically e.g. burglar alarms, central heating systems

	Research using the internet and BTEC tech award book into user interfaces, their features and hardware/software influences of selecting user interfaces.
	Written report on user interfaces including where the devices are commonly found in everyday use, features and accessibility of each devices with a range of examples given.
	Discussion on the range of different devices and the range of different features they have. Students can create a presentation which demonstrates their understandng of the key questions.
	Links to business, graphics and computer science

- Embedded systems
- These are much smaller computer systems that sit inside a larger system e.g. car automatic braking system, aeroplane autopilot

KQ4: What are the factors that affect the choice of user interface?

- Performance/response time
- How quickly the system allows you to complete tasks
- Ease of use
- Needs to be easy to use in order to engage users
- User requirements
- Consider the tasks you want to perform and then consider how well the user interface performs them e.g. simple to use, good use of colour, eye-catching, quick at completing tasks
- User experience
- Different users will have varying levels of experience with devices so therefore it is important to look at what features it has
- Accessibility
- Developing an interface will need to meet a range of needs including visual, hearing and speech e.g. a user may have sensitivity to the screen or have colour blindness, therefore it is better to have contrasting colours so the device can still be used.
- Storage space
- Enough space is required and needed for the device you will use e.g. GUI requires a lot of storage space because it tends to be more complex and has to store a lot of files.

KQ5: What are the hardware and software influences of user interfaces?

- Operating system/platforms
- The programming code that is created must be compatible with the operating system and platform e.g. if you create a user interface using Apple developer then this will only be compatible with iOS and therefore will not work on other platforms such as Android.
- Types/size of screen e.g. touchscreen vs traditional displays
- Size of display affects type of interface that can be used e.g. a smart watch will use a menu interface as there will not be enough room for a graphics to be displayed
- Also affects the way people interact. A touch screen can be used by your finger where the user will tap on the option but if the screen is too small, can allow the user to select other options accidently.
- Types of user input e.g. keyboard, mouse, voice, gestures
- Keyboard- physical or online keyboard to enter commands and keyboard shortcuts
- Mouse- the user will move the mouse to control the cursor and select onscreen options
- Voice- a user will use their own voice to say what they want
- Gesture- a user will carry out a gesture using their hand e.g., tapping, pinching, swiping movements.
- Hardware resources available e.g. processing power, memory

o Bigger devices will have more powerful hardware compared to portable devices, need to consider RAM (random access memory) and CPU (central processing unit) • Emerging technologies e.g. new innovations of input techniques o New and emerging technologies are constantly changing the way we interact with technology and user interface. Traditionally keyboard and mouse were used to interact with technology, but more recently touchscreen has taken over, this makes it harder for command line interfaces as takes longer to type in commands. Future technologies could include ore speech-based interfaces.		
HALF TERM 2: Audience Needs (A2, A3) KQ1: What accessibility needs to be covered when creating a user interface? • Visual o Users with visual needs may have limited vision or may be colour blind and not able to see certain colours o On an interface use colours that effectively contrast with each other o Have an option for the text on screen to be read out loud • Hearing o Individuals with hearing needs may have limited hearing and may not be able to hear everything, they may also lip-read when someone is talking to them o On an interface use subtitles for when people are speaking o Write in clear, plain English • Speech o Users with speech needs may take longer to communicate when they are talking and may not be able to say or pronounce all words clearly o Allow alternative methods such as entering commands on the keyboard o Allow the user many attempts to say a command • Motor o Individuals may not be able to move all their body, so it may take them longer to move the mouse cursor across the screen or use the keyboard to enter text. o Make sure objects onscreen are large so the user can easily select them o Allow the user to use shortcuts to speed up tasks o Allow the user to use their voice to input commands where possible • Cognitive o Users may need more time when they are completing tasks and may not be able to spell or say all the words o Provide a spell check to users can check their spelling o Have an option so the text on screen can be read aloud o Ensure the layout of each screen is consistent KQ2: Why is skill level important to consider when designing/creating a user interface? • Expert	📚	Research using the internet and BTEC tech award book into accessibility needs and be able to write a detail report on assessing the needs of two types of interfaces.
	✏️	Writtenn report on assessig the needs of a interfae by analysing a minimum of two and identifying how they work well for different needs e.g. Mcdonalds ordering system GUI, iPhone.
	💬	Discussion as a class and in pairs on a range of different interfaces from the four catgories and how they are adapted to meet specific users needs. Also if there are any additonal interfaces which are made for a specific need/purpose.
	🔗	Links with graphic design on the layout and look of technology and geography by looking at who is using the device and particular areas where devices are sold more because of the affordability, look, use and how they look around the world e.g. red in asia is seen as goodluck where as europre associated with danger etc.

o An expert user will have a lot of experience in using a range of technologies

o They will be confident and use them to navigate their way round a new interface on their own

• Regular

o Will have experience of using common, everyday devices and be able to use a user interface to complete almost all tasks

o They may need help occasionally but will be able to complete tasks on their own after being show how to.

• Occasional

o Will have some experience of using different devices and will be able to use a user interface to complete most tasks

o The user may need to complete a task several times before they are able to do it confidently.

• Novice

o Will have no or very little experience of using digital devices

o They will need to be supervised by another user with more advanced skills.

KQ3: why is it important to consider demographics when design an interface?

• User demographics

o The characteristics of who will be using the device to best design an interface

• Age

o His will look at how much experience ad what skills a user will have

o E.g. a young child will have little or no experience while an adult will have more experience with technological devices

• Culture and beliefs

o Someone's culture has a big influence on their beliefs and practices. This may be their nationality, religion or the language they speak.

o E.g. if you are designing a speech-based interface then it needs to allow people to speak in many different languages.

o E.g. use of colours, red is seen as a danger colour in Europe but good luck in Asia.

• Past experiences

o Users past experience will dictate what they have used before and how much they have used them.

o When a user uses a new interface for the first time, they will automatically try what they already know, therefore it is important to design user interfaces to match users prior experience e.g. iPhone 7 to 8.

Design Principles

KQ4: What are design principles and why is it important the look and use of an interface when designing?

• Colours

o Don't overuse to many colours as it can be difficult for the user to focus

o Make sure colours don't clash as the text can be difficult to see

- o Use textures in colours as it creates a feeling in people e.g. glossy colours that look smooth and shiny make things look professional, serious and calming.
- o Use organisation house style colours to ensure consistency and so it is easily recognisable to customers.
- Font style/size
- o Use appropriate font types and avoid decorative fonts which can be hard to read and understand
- o Ensure the font style and size is readable and is consistent throughout to give a clean and professional look.
- Language
- o Use language appropriate for the user needs and skills level by trying to keep the amount of technical language to a minimum.
- Amount of information
- o Use appropriate information for the task and make appropriate use of white space.
- Layout
- o Consistency throughout the whole interface
- o Keeping the layout as close as possible to user expectations
- o Placing important items in prominent positions
- o Grouping related tasks together
- User perception
- o Colour e.g. green to indicate go/successful interactions, orange to indicate warnings, red to indicate errors/stop
- o Sounds e.g. positive high-pitched sounds, negative low-pitched sounds
- o Symbols e.g. green ticks, red crosses
- o Visuals, e.g. photographs, symbols, graphics
- Retaining user attention
- o Grabbing attention e.g. pop-up messages, flashing graphics, sound, animation
- o Ensuring the screen is uncluttered
- o Clearly labelled items/features
- o Use of predetermined/default values of common user input
- o Use of autofill to reduce the amount of data entry e.g. postcodes
- o Use of tip text to provide help if the user is unsure what buttons/tools do.
- Intuitive design
- o Use graphics to denote what buttons do
- o Helpful pop-up messages
- o Easy-to-use help features
- o Ensuring consistency
- o Easy reversal of actions

KQ5: What are the techniques that can be used to improve both speed and access to user interfaces:

- User of keyboard shortcuts
- o Sometimes it can take a long time to complete tasks on interfaces, so sometimes it is good to use keyboard shortcuts. Many interfaces have these by pressing a combination of keys, this speeds up the time it takes to complete a task e.g. Ctrl + C = Copy, Ctrl + V= Paste
- Informative feedback
- o It is useful to give feedback so the user can see if their interactions are successful. This will give novice and

occasional users more confidence in knowing they are completing tasks correctly e.g. *'thank you for your order'* would confirm the users intention to purchase an order was completed.

- Easy reversal of actions
- o When individuals are completing tasks on a user interface it is not uncommon for mistakes on previous pages to have occurred e.g. entered the wrong door number for delivery of a purchase. Many shops have a banner which shows address, items, billing, and confirmation and allows the customer to go back to any part of their order before finalising.
- Ensuring buttons/links are distinguishable
- o The user interface should be disguisable between each part of the user interface, This can speed up their interaction if they know which areas require them to read something and which require to do an action e.g. if a person sees a link which is blue and underlined, they automatically know this is a hyperlink and once clicked will take them to another location.
- Using bigger objects to influence selection and reduce selection time
- o Objects that are bigger can be seen more easily and selected more quickly: the size of the object can also influence the user's selection. It is important that the whole object is selectable and to just the text inside the box.
- Making objects stand out to reduce focus time
- o A way to reduce selection time is to make objects stand out. This can be achieved by using colour, emphasis and font styles such as bold, italic or underlined. E.g. using a large 'add to basket' button may allow users to quickly add items to their shopping basket, however, delete buttons will be smaller and more difficult so therefore making it harder for users to delete items from their basket
- Placing related objects next to each other to reduce selection time
- It is important to group related objects together. By grouping relating objects, this reduces selection time e.g. Microsoft Word groups their tools into separate areas e.g. grouped font/font size/stile and colour are all grouped together.

HALF TERM 3: Project Planning techniques		
KQ1: What is project planning and what are the techniques that can be used to manage projects? • <u>Planning tools</u> o Task lists ▪ Numbered list of tasks or actions that need be completed o Written or graphical description o Gant charts ▪ A timeline that is used as a project management tool to illustrate how the project will run. You can view individual tasks, their durations and the sequencing of these tasks. o PERT charts		Research into project planning methods and how they work for other businesses.
		Write up of project methodologies and students will be able to create a range of different materials from Gantt charts to Pert charts in order to show how they will manage a project.
		Class/paired discussion on projects that have failed e.g. NHS systems and why. Also looking at projects which have succeeded due to their good project planning techniques.

- ▪ Project management tool used to schedule, organise and coordinate tasks within a project.
- o Mood boards
- ▪ Visual tool which communicates concepts and visual ideas.
- o Mind maps
- • Methodologies
- o Project methodologies is how the time within a project is structures and what order the tasks will be completed in. there are two main ones to look at which are:
- o Waterfall
- ▪ The waterfall model is a breakdown of project activities into linear sequential phases, where each phase depends on the deliverables of the previous on
- o Iterative
- ▪ This is when there is no clear pathway from start to finish of a project. This methodology has a reduced amount of planning at the beginning to complete the project faster.
- ▪ An example of iterative approach is the agile methodology. This methodology breaks down the project into small parts which is then completed in priority order in stages of around two weeks each

KQ2: Which methods are suitable when planning a project and developing a project plan?
- • SMART aims/objectives
- o Specific- Aims and objectives must be clear and as precise as possible. Need to state exactly what you want to achieve e.g. who, what where, why
- o Measurable - Aims and objectives must be measurable so that at the end of the project you will be able to see what extent they have been met
- o Achievable - Aims and objectives must be 'doable'. This means that they can be achieved by the person completing the project and within the time given
- o Realistic - Aims and objectives must be feasible. It is important to set challenging aims and objectives, but they should not be too hard to complete.
- o Timely - Aims and objectives need to be given a time frame where a clear date and time as to when each task within the project will be completed.
- • Audience and purpose
- o The target audience is the people who will be using the system. It is important to consider their needs at the very start of a project to ensure that the system is suitable and will be accepted and used by the Target audience.
- o The purpose is the reason why something is created. Considering the purpose at the very start ensures that the system does what the client wants and what they are paying for.
- • Project requirements
- o User requirements - These are the requirements the client wants the system to do or contain e.g. easy to use, the items they want on screen or where they want them places.
- o Output requirements e.g. visual, audio, haptic
- o Input requirements e.g. mouse, keyboard, voice, touch
- • Timescales

Links in with business by looking at how to plan and manage projects effectively and sticking to budgets. Also links in with maths by sticking to timescales and budgeting.

o Overall timescale o When tasks will be completed, including sub-tasks o Key milestones, including iterative review points with the user o When resources will be needed • Constraints o Time o Resources o Task dependencies o Security • Risks o Potential risks to project e.g. running out of time, no internet, not enough knowledge etc. o Contingency planning- what will be put in place in case a risk occurs e.g. running out time- plan extra time for catch up days. **KQ3: Why will creating an initial design assist when developing an interface and what principles are needed?** • Initial design o User requirements including input and output requirements o User accessibility needs • Design specification o Visualisation e.g. storyboard, sketches o Hardware requirements o Software requirements o Test strategies • Designs o Increased user confidence/familiarity reduce learning time of new interface/features o Reduce time to complete tasks o Increased user attention o Reduced need for specialised knowledge		
HALF TERM 4: Developing and reviewing a user interface **KQ1: How to develop a user interface and what needs to be included?** • Features o Awareness of intended device e.g. touchscreen, watch o How the user requirements have been met o Overall look and feel o Inputs e.g. key presses, mouse clicks, touch o Outputs e.g. sounds, images, error messages o Navigation methods o Ease of use • Refining the user interfaces o Presenting the design to potential users o Refining the interface to account for potential feedback o Repeating the iterative process until the design is complete o Document changes made through each iteration **KQ2: How did the user interface and chosen planning techniques work?** • Strengths and weaknesses of the user interface: o How well the user requirement has been met o Have the SMART objectives been met, if so, how?	 	Students will need to look at past work to identify the user needs in the project and project planning techniques. Student can also use the internet to further research and colours etc. to use. Following design plans to create a product based on user needs and evaluating overall project with a written report discussing what they have created, methods used, WWW and how they can improve on the interface. Class/paired discussion on evaluating products as a class and how projects can fail if not stuck to the project planning techniques. Links with English by evaluating their products at the end and identifying what went well and how this can be developed. Links with Business, as they are developing a product to meet specific user needs

o Suitability for audience and purpose
o Ease of use
o How effectively the design principles have been met
o Areas that could be developed to be better meet audience needs/design principles
• Strengths and weaknesses of project planning techniques:
o How well the chosen project planning and methodologies met the needs of the task
o Project constraints and how they were overcome
o Impact of using an iterative design approach
o Lessons learned

HALF TERM 5: Modern Technologies

Component 3: Effective Digital Working Practices
KQ1: How and why modern technologies are used by organisations and stakeholder to access and manipulate data?
• Communication technologies
o Setting up ad hoc networks (open Wi-Fi, tethering, personal hotspots)
- Ad hoc networks are created between two or more wireless PCs together, without the use of a wireless router or an access point.
o Security issues with open networks e.g. open networks not requiring usernames or passwords
o Performance issues with ad hoc networks e.g. limited range, poor signal
o Issues affecting network availability e.g. rural Vs city locations, developed Vs developing countries, blackspots
• Features and uses of cloud storage (where files created and used on one or more computers or devices are stored and managed remotely)
o Setting and sharing access rights
o Synchronisation of cloud and individual devices
o Availability (24/7)
o Scalability (getting more by renting/freeing to save money)
• Features and uses of cloud computing (Web-based applications which run entirely through browsers)
o Online applications
o Consistency of versions between users
o Single shared instance of a file
o Collaboration tools/features
• Selection of platforms impacts clout technologies:
o Number and complexity of features
o Paid for versus free
o Interface design including layout, accessibility, mobile Vs desktop
o Available devices
• Implications for organisations when choosing cloud technologies:
o Consideration of disaster recovery policies
o Security of data
o Compatibility
o Maintenance including software updates, downtime, staff expertise
o Getting a service/storage up and running quickly

o Performance considerations (responsiveness to user, complexity of task, available devices.

KQ2: Explain the impacts of modern technologies on organisations?

- Changes to modern teams facilitated by modern technologies:
o World teams
o Multicultural
o Inclusivity
o 24/7/365
o Flexibility (remote working Vs Office based)
- How modern technologies can be used to manage teams
o Collaboration tools
o Communication tools
o Scheduling and planning tools e.g. online calendar
- How organisations use modern technologies to communicate with stakeholders
o Communication platforms (website, social media, email)
o Selecting appropriate communication channels for sharing information and data. (private/direct message, public status update)
- Positive and negative impacts of modern technologies on **organisations:**
o Requirements infrastructure (communication technologies, devices)
o Demand on infrastructure of chosen tools/platforms
o Availability of infrastructure
o 24/7 access
o Security
o Collaboration
o Inclusivity (age, health, additional needs, multicultural)
o Accessibility (meeting legal obligations, provision requirements)
o Remote working
- Positive and negative impacts of modern technologies on individuals:
o Flexibility (home/remote working)
o Working styles (choice of time, device, location)
o Impact on individual mental wellbeing (depression, loneliness, self-confidence, separation from stressful environment, feel in control of own schedule, schedule adjusted to meet needs of family, less time commuting)

HALF TERM 6: Cyber Security

KQ1: What are the threats to data?
- Why systems are attacked:
o Fun/challenge - Hackers may attack systems for thrill, adrenaline rush or sense of personal achievement
o Industrial espionage - This is where individuals will attack an organisation such as stealing design, business strategies etc. and possibly copying or providing cheaper products in order to make the organisation lose money
o Financial gain - Obtaining money from victims of a cyberattack

	Example policies used within organisations e.g. acceptable use policy etc.
	Explanation of each of the threats to a computer/network and the methods that are available to prevent them.
	Peer presentation/explanation of how threats to data are prevented and managed.

o Personal attack - Some attacks are personally motivated e.g. ex-employees who hold a grudge against the former company/employer

o Disruption - An attack that prevents a company from operating normally resulting in loss of earning and reputational damage.

o Data/information theft - These can be sold to criminal gangs or organisations for financial gain. This is done by stealing customer payment information that is used to purchase goods.

• External threats (threats from outside the organisation) to digital systems:

o Unauthorised access/hacking - Where users attempt to gain access to remote systems without the permissions or authorisation of the owners to do so legally.

o Malware (Virus, worms, botnet, spyware)

- Virus - designed to cause harm to a computer system by deleting files

- Word - replicates itself across a network. Usually designed to make a computer inaccessible

- Spyware – record a computer users actions, key strokes and relay them back to a third party

o Phishing (fake emails) - Spoof email pretending to be from a legitimate company. Spoof means that the email is forgery but looks genuine.

o Pharming - This is a combination of phishing and farming. This is where a user is maliciously directed to a fake website thinking is it real and they unwittingly enter confidential details such as usernames and passwords. Cyber criminals capture these details.

o Social engineering - This is where individuals contact users via email or phone pretending to be the users bank and asking them to confirm there identify such as username and password.

o Shoulder surfing - Spying on the user of a cash-dispensing machine or other electronic device in order to obtain their personal identification number, password,

o 'Man, in the middle' attack - This is where the network is intercepted between the user and web server, where the attacker can obtain confidential information.

o Denial of service attack - A cyber-attack in which the perpetrator seeks to make a machine or network resource unavailable to its intended users by temporarily or indefinitely disrupting services of a host connected to the Internet

• Internal threats (threats within the organisation)

o Disclosure of data - Can be accidentals or malicious and require overriding security controls and portable storage devices.

o Stealing or leaking information - Selling to a rival (industrial espionage) for financial gain, revenge, social or political reasons.

o Users overriding security controls - An attempt to access data or information they should not access

o Use of portable storage devices - Such as USB drives which may be infected with viruses or be used to copy and remove secure data from the organisations

Links to Computer Science –Threats to a computer/network and the methods that are available to prevent them.

o Downloads from the internet - Illegal (or non-approved) software which may contain viruses and infect IT systems

o Visiting untrustworthy websites - May have phishing threats or contain downloadable viruses

- Impact of security breaches:

o Data loss

o Damage to public image

o Financial loss

o Reduction in productivity

o Downtime

o Legal action

KQ2: How are threats to data prevented and managed?

- User access restriction- this is to restrict who can access/see what, measures that can be used are:

o Physical security measures (locks, swipe cards)

o Passwords

o Using correct settings and levels of permitted access

o Biometrics (iris, thumbprint etc.)

o Two factor authentications (password and security question characters)

- Data levels protection of a system include:

o Firewall

o Software/interface design e.g. not staying logged in after five minutes of inactivity)

o Anti-virus software

o Device hardening (eliminate attacks by having security controls e.g. password management, disabling unused network port)

o Back-ups for recovering data

o Encryption of stored data and transmitted data (encryption is where passwords are mixed up which in unreadable by humans)

- Identifying weaknesses in order to improve system security include:

o Ethical hacking- individual who is employed by a company to try and gain access to a system in order to identify any vulnerabilities, there are two types of ethical hackers which are:

- White hat hacker- asks for permission before testing the system security at an organisation

- Grey hat hacker- will attempt to compromise a computer system without permission

- Penetration testing- simulated attack on a computer to check for vulnerabilities

- Analyse system data/behaviours to identify potential risks

KQ3 – What are policies and why organisations need security policies in place?

- Defining responsibilities

o Who is responsible for what?

o How to report concerns

o Reporting to staff/employees

- Defining security parameters:

o Password policy e.g. change every 8 weeks

o Acceptable software/installation/usage policy

o Timeline for data recovery

o Location of alternative provision (hardware & Software)

- Actions to take after an attack

o Investigate (establish severity and nature) o Respond (inform/update stakeholders and appropriate authorities) o Manage (containment, procedures) o Recover (implement disaster recovery plan, remedial action) o Analyse (update policy and procedures)		