Scheme of work
Cambridge International AS & A Level
Information Technology
9626

For examination from 2017

Cambridge Advanced

Cambridge International AS & A Level

CAMBRIDGE International Examinations

Contents

Overview

This scheme of work provides ideas for teachers about how to construct and deliver a course for Cambridge International AS & A Level Information Technology (9626). The syllabus has been broken down into teaching units with suggested teaching activities and learning resources to use in the classroom. This scheme of work, like any other, is meant to be a guideline, offering advice, tips and ideas. It can never be complete but aims to provide teachers with a basis for planning their lessons. As well as making sure that the content of the Information Technology syllabus is covered, it includes development ideas for topics. It does not take into account that different schools take different amounts of time to cover the Cambridge International AS and A Level course.

Recommended prior knowledge

We recommend that learners who are beginning this course should have previously completed a Cambridge IGCSE® course, or the equivalent, in Information and Communication Technology or in Computer Science.

Guided learning hours

Guided learning hours give an indication of the amount of contact time teachers need to have with learners to deliver a particular course. Our syllabuses are designed around 180 hours for Cambridge International AS Level, and 360 hours for Cambridge International A Level. The number of hours may vary depending on local practice and the learners' previous experience of the subject. The table below gives some guidance about how many hours are recommended for each topic.

Outline

Topic	Level	Suggested teaching time (hours)	Suggested teaching order
Data, information, knowledge and processing	AS Level	About 16	**Teach early on in the course**
Hardware and software	AS Level	About 16	**Teach early on in the course**
Monitoring and control	AS Level	About 20	**Can be taught at any time**
E-safety and health and safety	AS Level	About 15	**Can be taught at any time**
The digital divide	AS Level	About 15	**Can be taught at any time**
Using networks	AS Level	About 20	**Teach early on in the course, specifically before 'Networks'**
Expert systems	AS Level	About 15	**Can be taught at any time**
Spreadsheets	AS Level	About 25	**Teach early on in the course**
Database and file concepts	AS Level	About 25	**Teach early on in the course**
Sound and video editing	AS Level	About 20	**Can be taught at any time**
Emerging technologies	A Level	About 15	**Can be taught at any time**
Role and impact of IT in society	A Level	About 20	**Can be taught at any time**
Networks	A Level	About 20	**Can be taught at any time**

Project management	A Level	About 15	**Can be taught at any time**
System life cycle	A Level	About 18	**Can be taught at any time**
Graphics creation	A Level	About 20	**Can be taught at any time**
Animation	A Level	About 20	**Can be taught at any time**
Mail merge	A Level	About 15	**Can be taught at any time**
Programming for the web	A Level	About 30 hours	**Can be taught at any time**

Teaching approach

Whole class **(W)**, group work **(G)**, pair **(P)** and individual activities **(I)** are indicated, where appropriate, within this scheme of work. Suggestions for homework **(H)** and formative assessment **(F)** are also included. The activities in the scheme of work are only suggestions and there are many other useful activities to be found in the materials referred to in the learning resource list.

There is the potential for differentiation by resource, grouping, expected level of outcome, and degree of support by teacher, throughout the scheme of work. Length of time allocated to a task is another possible area for differentiation.

Key concepts

The key concepts on which this syllabus is built are set out below. These key concepts can help teachers think about how to approach each syllabus topic in order to encourage learners to make links between topics and develop a deep overall understanding of the subject.

- **Impact of Information Technology**
  Information Technology (IT) is the application of technology to process information. The impact of IT on all aspects of everyday life is immense. The enormity of the impact can be seen in industry and commerce, transport, leisure, medicine and the home. The impact on the workforce is a very important factor to consider and communications using new technologies have made the World seem smaller.

- **Hardware and software**
  Many hardware components and software applications are used in IT systems. It is important to understand how these work, and how they interact with each other and within our environment.

- **Network**
  Computer systems can be connected together to form networks allowing them to share resources.

- **The internet**
  The internet is a global communications network that allows computers worldwide to connect and share information in many different forms. Examples include email, web pages, and audio and video files. The impact of the internet on our lives is profound. While it provides huge benefits to society, security of data is an issue, both in the workplace and for personal data.

- **System life cycle**
  Information systems are developed within a planned continuous cycle that covers the initial development of the system through to its scheduled updating or redevelopment. Each phase of development is organised into separate stages.

- **New technologies**
  As the information industry changes so rapidly, it is important to keep track of new and emerging technologies and consider how they might affect everyday life.

Teacher support
Teacher Support (https://teachers.cie.org.uk) is a secure online resource bank and community forum for Cambridge teachers, where you can download specimen and past question papers, mark schemes and other resources. We also offer online and face-to-face training; details of forthcoming training opportunities are posted online.

This scheme of work is available as PDF and an editable version in Microsoft Word format; both are available on Teacher Support at https://teachers.cie.org.uk. If you are unable to use Microsoft Word you can download Open Office free of charge from www.openoffice.org.

Resources
The up-to-date resource list for this syllabus, including textbooks endorsed by Cambridge, is listed at www.cie.org.uk and Teacher Support https://teachers.cie.org.uk.

Endorsed textbooks have been written to be closely aligned to the syllabus they support, and have been through a detailed quality assurance process. As such, all textbooks endorsed by Cambridge for this syllabus are the ideal resource to be used alongside this scheme of work as they cover each learning objective.

Websites and videos
This scheme of work includes website links providing direct access to internet resources. Cambridge International Examinations is not responsible for the accuracy or content of information contained in these sites. The inclusion of a link to an external website should not be understood to be an endorsement of that website or the site's owners (or their products/services).

The particular website pages in the learning resource column of this scheme of work were selected when the scheme of work was produced. Other aspects of the sites were not checked and only the particular resources are recommended.

Data, information, knowledge and processing (AS Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
1.1 **Key concept: Impact of Information Technology**	**Data, information and knowledge** • define data, clearly identifying that data has no meaning • define information and show how data can become information through context and meaning • define knowledge and understand that information becomes knowledge when human experience is applied	It is important for learners to understand how data is turned into information through the introduction of context and meaning, and how information becomes knowledge through the application of experience. Provide learners with a table with the following headings: • Data • Information • Knowledge Give learners an example to start e.g. | Data	Information	Knowledge
01011995	Context – This data is a date 01/01/1995. Meaning – This is the date of my best friend's birthday.	Experience – I need to make sure I buy a present before this date for my best friend. | Ask learners to complete three other entries in the table that demonstrate taking data through to information. **(I) (F)** You could give learners pieces of data if they are struggling to come up with their own. They then give this data a context and meaning and finally apply knowledge to it.

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
1.2	**Sources of data** • define static data and give an example • define dynamic data and give an example • compare the use of static information sources with dynamic information sources • define direct and indirect data source • understand the advantages and disadvantages of gathering data from direct and indirect data sources	Give learners four different sources of data to review. Two of the sources should be static such as a printed poster or leaflet, and two should be dynamic such as a website. Ask learners to identify which resources are static and dynamic and state why. **(G) (F)** Ask learners to identify the characteristics of the different information sources and make a list of the advantages and disadvantages of each. Ask learners to draw a conclusion as to whether they think static or dynamic sources of information are better. They need to provide a justification for their choice. **(G) (F)** Provide learners with a table that includes a list of different scenarios that require data. Use the following headings: • Data required • Direct • Indirect • Justification Learners decide the best choice of data source, 'Direct' or 'Indirect' and tick the appropriate column. They should provide a justification for their choice **(I) (F).** An example is: <table><tr><th>Data required</th><th>Direct</th><th>Indirect</th><th>Justification</th></tr><tr><td>Which film was the most watched at the cinema in 2015?</td><td></td><td>✓</td><td>It is likely that data is already recorded on the viewing figures for each film in 2015. I just need to get the viewing figure for each film and see which is the highest.</td></tr><tr><td>What do our customers like more about product A than product B?</td><td>✓</td><td></td><td>To get this information the company needs to do some market research into the products. It isn't likely that this data already exists, so a representative will need to collect the data directly from a wide range of customers.</td></tr></table>

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
1.2 continued		This website has some further information about sources of data: http://www.teach-ict.com/as_a2_ict_new/ocr/AS_G061/311_data_info_knowledge/static_dynamic_data/miniweb/index.htm
1.3 **Key concept: Impact of Information Technology**	**Quality of information** • understand how accuracy, relevance, age, level of detail and completeness of the information can affect its quality	Give learners an example of a poor-quality leaflet. The leaflet should have incomplete, inaccurate information that lacks detail and is out of date. For example, make the leaflet about a charity event, then ask learners to identify a number of pieces of information about the event such as who it is for, where the event is held etc. They should find that they cannot identify all this information. As a class, discuss what the effect is of the poor quality of this information and describe how the quality could be improved. **(W)** These websites contain information on factors that affect the quality of information: http://www.teach-ict.com/gcse_new/data_info_knowledge/quality/miniweb/index.htm http://www.computerbusinessresearch.com/Home/database/five-characteristics-of-high-quality-information
1.4 **Key concept: Impact of Information Technology**	**Coding, encoding and encrypting data** • describe the coding of data (including: M for male, F for female) and more intricate codes (including: clothing type, sizes and colour of garment) • discuss the advantages and disadvantages of the coding of data	Give learners a list of clothing items that a clothing retail company is about to stock in its store. Tell learners that in order to be efficiently stored in a database and referred to, each item of clothing must be given a code. Explain that the code must come from the information about the clothing item and should identify the item. An example is: A black pair of trousers that have a waist of 32 and a leg length of 31 could be coded as – BLKTR32W31L Ask learners to create suitable codes for the remainder of the items on the list. **(I)** Ask learners, in pairs, to compare their coded lists. Ask them to see if they can shorten any of the codes created. Then ask learners to discuss what would happen if they shortened the codes too much. **(P)** Discuss with learners why the retail store would want to create codes for their clothing in this way. **(W)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
1.4 continued	• evaluate the need for encoding data and analyse the different methods that can be used to encode data (including: codecs) • define encryption and describe different methods of encryption (including: symmetric, asymmetric, public key, private key) • evaluate the need for encryption and how it can be used to protect data such as on a hard disk, email or in HTTPS websites • discuss encryption protocols (including: the purpose of Secure Socket Layer (SSL)/Transport Layer Security (TLS) and the use of SSL/TLS in client server communication)	Give learners a simple message that has been encrypted with a simple Caesar cypher e.g. Each consonant moves forward five letters in the alphabet and each vowel moves back two letters. This would turn 'Hello' into 'MCQQM' when encrypted. Ask learners to try and decrypt the message by working out the cypher. **(I)** Explain to learners that what they have just used is a symmetric method of encryption. Ask learners why it is symmetric. Then ask them to explain what they think happens in asymmetric encryption, from their understanding of symmetric. **(W)** Ask learners to research and create a presentation to inform their peers about encryption. The presentation should: • express the importance of encryption in their lives as well as any disadvantages • describe and compare methods of encryption: symmetric, assymetric, public key and private key • describe and compare different methods of encoding data, such as codecs • explain the use of encryption to protect data • describe the encryption protocols SSL and TLS and their uses. **(I) (H) (F)** These resources contain information about encoding and encrypting data: https://www.techopedia.com/definition/948/encoding http://searchnetworking.techtarget.com/definition/encoding-and-decoding http://computer.howstuffworks.com/encryption.htm

1.5	**Checking the accuracy of data**	Give learners a list of validation methods and a list of descriptions. Ask learners to match the correct validation method with the correct description. **(I) (F)**
Key concept: Impact of Information Technology	• define validation and analyse a range of validation methods (including: presence check, range check, type check, length check, format check and check digit, lookup check, consistency check, limit check)	Ask learners why, when they create a new password for an account, they might be asked to enter the password twice. Explain to learners that this is a method of verification. **(W)**

Give learners a set of data that meets certain validation methods. Tell them what validation methods have been set on each field. Include some deliberate mistakes in the data but make sure that it still meets the validation set. Ask learners to discuss whether the data in its current form can be relied on to be accurate. Ask learners how the accuracy could be improved (bringing in proofreading and double entry if needed) and link that into a discussion about the necessity for both validation and verification. **(W)** |
| | • define verification and analyse verification methods (including: visual checking and double data entry) | Resources that give information about checking the accuracy of data:

http://www.bbc.co.uk/education/guides/zdvrd2p/revision |
| | • explain the need for both validation and verification | http://www.teach-ict.com/as_a2_ict_new/ocr/AS_G061/311_data_info_knowledge/validation_verification/miniweb/pg2.htm |
| | • define proofreading | |

Hardware and software (AS Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
2.1 **Key concept: Hardware and software**	**Hardware** • define the term hardware • evaluate internal hardware devices (including: central processing unit (CPU), motherboard, random access memory (RAM), read only memory (ROM), graphics card, sound card, hard disk drive (HDD), solid state drive (SSD)) • evaluate external hardware devices (including: cloud, monitor, keyboard, mouse, printer (laser, inkjet, dot matrix, plotter), speakers, camera (digital, video), web cam, scanner, magnetic ink character reader (MICR), optical mark reader (OMR), optical character reader (OCR), bar code reader, pen drive, portable hard disk drive, blue-ray disk drive, memory card) • explain the purpose of storage devices • evaluate storage devices (including: magnetic tape drive, optical, hard disk drive (HDD), solid state drive (SSD)) • explain the purpose of input and output devices • evaluate different input, storage or output devices for a given task	It is helpful to obtain and demonstrate as many examples of the hardware listed as possible. Seeing the hardware used often helps learners understand its role and importance. Give learners a diagram of a computer that illustrates the internal hardware devices listed. Ask learners to label the diagram and write a definition for each hardware device. **(I) (H) (F)** Provide learners with a list of tasks that require hardware devices in order to carry them out, including some input, some storage and some output devices. The tasks should be ones for which a certain hardware device from the list is more suitable than others. Ask learners to identify the most suitable hardware device(s) for the task and ask them to justify their choice. **(G) (F)** Ask each group to feedback their choices and where any differences occur, ask them to debate which group made the better choice and why. **(W)** These websites have some useful information about different hardware devices: http://www.bbc.co.uk/schools/gcsebitesize/ict/hardware/0inputandoutputdevicesrev1.shtml http://www.computerhope.com/jargon/i/inputdev.htm http://www.tutorialspoint.com/computer_fundamentals/computer_input_devices.htm http://www.ictlounge.com/html/manual_input_devices.htm

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
2.2 **Key concept: Hardware and software**	**System, application and user interface software** • define the term software • evaluate types of software (system software and application software) • explain the purpose of system software (including: compilers, linkers, device drivers, operating systems and utilities, interpreters) • evaluate application software (including: word processing, spreadsheet, database management systems, control software, measuring software, applets and apps, photo editing software, video editing software, graphics manipulation software, communications software, web authoring software) • evaluate application software for a given task • evaluate the characteristics of different types of user interface (including: command line interface, graphical user interface, dialogue interface, gesture based interface)	Play a game of 'What am I?' with learners. Create cards with the title 'What am I?' and have a description of each type of system software, application software and utility software. Learners need to guess, using the information about the software. For example: **What am I?** • I transform source code into machine code • I transform the whole of the program at once • I create an executable file as an output Answer: I am a COMPILER This game can be developed by having a single clue on each card and having three/four clues for each software type. Learners work in pairs and read a clue at a time. The aim of the game is to guess the type of software using the fewest clues. **(P) (F)** Learners briefly discuss each of the application software types, searching for information if they don't know any of them. **(P)** They then think of and write down a suitable task for each of the types. **(I)** In pairs, they compare their answers. **(P)** Summarise findings with a class discussion. **(W)** Provide learners with the four different types of user interface. Give them a task to complete, such as create and store a message. Ask them to write down answers to the following: • Could they complete the task using each different interface? • Which interface was easiest to use to complete the task? Why? • What characteristics can they identify for each interface? • What characteristics (if any) are missing for each interface? **(I) (H)**

2.2 continued	• evaluate the use of colour, layout, font size, quantity of information and controls when designing a user interface	Create a grid for learners to complete, that contains examples of different things that could occur in a mental model. Learners should think of answers using their experience of computers, but without looking at a computer. **(G).** For example:
	• evaluate mental models and how they can be used when designing a user interface	• What colour would be used in a message to show a user had got something wrong? • What colour would be used in a message to show a user had got something right? • Where is the button to bring up the start menu on a computer? • In which order would you expect to fill out a form (top-to-bottom, bottom-to-top, left-to-right, right-to-left)? Learners will probably find that all the groups have similar answers and a discussion can then be held about why we have these mental models. As part of the discussion consider what would happen if we 'broke' the mental model e.g. used red in a message that was telling a user they had got an answer correct. How would this affect the user? **(W)** These resources give some information about mental models: http://www.nngroup.com/articles/mental-models/ http://www.teach-ict.com/as_a2_ict_new/ocr/A2_G063/332_designing_systems/mental_models/miniweb/index.htm
2.3 **Key concept: Hardware and software**	**Utility software** • define utility software • describe the role of different utility software (including: anti-virus, back-up, data compression, disk defragmentation, formatting, file-copying, deleting)	The following are resources that give information about software: http://www.teach-ict.com/gcse_computing/ocr/211_hardware_software/types_sw/miniweb/pg2.htm http://study.com/academy/lesson/what-is-application-software-definition-examples-types.html http://www.bbc.co.uk/schools/gcsebitesize/ict/system/evaluationrev3.shtml

2.4 **Key concept: Hardware and software**	**Custom written software and off-the-shelf software** • compare the benefits and drawbacks of custom written software and off-the-shelf software	Give learners three case studies about three different businesses that require a new piece of software. Make sure that for each case study, either custom written software, or off-the-shelf software is more suitable. In groups, learners read through the case studies and make a written recommendation to the business, telling them whether they should choose an off-the-shelf piece of software or a custom written piece of software. They should provide at least three reasons for their recommendation. **(G) (F)**
2.5 **Key concept: Hardware and software**	**Compiler and interpreter** • describe the function of a compiler • describe the function of an interpreter • evaluate the difference between a compiler and an interpreter	Give learners a table that has some statements about compilers and interpreters. Learners complete the table by ticking whether the statement is about a compiler, an interpreter or both. **(I) (H) (F)** The following websites have information about compilers and interpreters: http://www.teach-ict.com/as_as_computing/ocr/H447/F453/3_3_2/translators_compilers/miniweb/pg14.htm http://www.c4learn.com/c-programming/compiler-vs-interpreter/

Monitoring and control (AS Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
3 **Key concept: Hardware and software**	**Monitoring and control** • identify a range of sensors and describe their use in monitoring technologies • identify a range of sensors and describe their use in control technologies • evaluate the use of monitoring technologies in everyday life (including: CCTV monitoring, environmental monitoring, workplace monitoring) • evaluate the use of control technologies in everyday life (including: household appliances, car park barriers, traffic lights)	Give each group of learners a different type of control/monitoring system, for example: • Air conditioning system • Refrigeration system • Car manufacturing system • CCTV security system • Traffic light system Learners produce a presentation identifying the sensors that will be used in the system and what their role and importance is. Learners should also explain why each of these systems has become a computer-based control/monitoring system, and what the benefits of this are. Discuss whether there are any drawbacks to the systems becoming automated. **(G) (F)** The following websites contain information about control/monitoring systems: http://home.howstuffworks.com/ac2.htm http://home.howstuffworks.com/refrigerator1.htm http://electronics.howstuffworks.com/robot3.htm http://blogs.howstuffworks.com/transcript/how-does-a-traffic-light-detect-cars.htm

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
4 **Key concept: Impact of Information Technology** **Key concept: The internet**	**E-safety and health and safety** • explain why personal data should be kept confidential • describe how personal data can be gathered by unauthorised persons (including: by smishing, vishing, phishing and pharming), and how this might be prevented • discuss why e-safety is necessary • describe malware issues (including: Trojan Horse, worms, spyware, adware, rootkit, malicious bots, ransomware) • describe a range of potential health issues that could arise from using IT • describe a range of safety issues relating to the use of IT	In groups, learners produce an e-safety video for their peers. Their video should address the following areas: • In what different ways can your personal data be gathered or obtained via the internet? • What kinds of malware can be transferred to your computer via the internet? • What health issues can occur through using computers? • What safety issues can you encounter when using computers? In each of the above cases, learners must also explain what preventative methods can be taken to guard against these issues. **(G) (F)** Set guidelines for the videos such as: • Each video should be between 6 and 8 minutes in length. • Each member of the group must be involved in the video at some point. • At least two different editing effects/skills in both audio and video should be demonstrated. This activity can be linked into the audio and video editing modules as a practical task. The following websites could be used for research: http://techterms.com/definition/malware http://www.webopedia.com/DidYouKnow/Internet/virus.asp http://www.teach-ict.com/gcse_new/health_safety/miniweb/ http://www.bbc.co.uk/schools/gcsebitesize/ict/implications/3healthandsafetyrev1.shtml

The digital divide (AS Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities

5
 	
Key concept: Impact of Information Technology
 	
Key concept: The internet
	The digital divide
	
	• understand that the digital divide refers to the gap between people and regions that have access to aspects of modern technology (including: telephone, television, personal computers and the internet), and those that do not or those that have restricted access
	
	• understand that the digital divide can exist between:
	  – people in cities and people in rural areas
	  – the educated and the uneducated
	  – socioeconomic groups
	  – more and less industrially developed nations
	  – high and low performance computers, wireless connections
		Ask learners to carry out research about the digital divide and write a report on its current status, making suggestions on how it can be improved. Set criteria for the report such as:
		
		• Explain what the digital divide is
		• Explain why the digital divide has occurred
		• Include at least three areas that create a divide in digital usage
		• The report must be no less than 2000 words
		• Suggest at least two ways in which the divide could be improved. **(I) (H)**
		
		The following websites could be used for research:
		
		http://news.bbc.co.uk/1/hi/technology/8568681.stm
		
		http://whatis.techtarget.com/definition/digital-divide
		
		http://www.internetworldstats.com/links10.htm
		
		http://www.theguardian.com/global-development-professionals-network/2014/jan/24/digital-divide-access-to-information-africa
		
		http://www.edutopia.org/blog/digital-divide-technology-internet-access-mary-beth-hertz

Using networks (AS Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
6.1 **Key concept: Network** **Key concept: The internet**	**Network types** • discuss the advantages and disadvantages of networking computers • compare the characteristics of a local area network (LAN) with a wide area network (WAN) • describe client-server and peer-to-peer networks • describe the characteristics and purpose of virtual private networks (VPN) • discuss the advantages and disadvantages of different network types (including: client-server, peer-to-peer, VPN) • describe the characteristics and purpose of intranets and extranets	Give learners a table with various characteristics of different networks. Learners tick which statements they think applies to each network. They could apply to more than one. **(I) (H)** For example:

Statement	LAN	WAN	Client - server	P2P	VPN	Intranet	Extranet
All computers in the network are in a close geographical area							
This network is normally accessed using a username and password							
A network that creates an encrypted connection							

As a class, discuss the applications of, and advantages and disadvantages of, the different network types. **(W)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
6.1 continued	• describe the characteristics and purposes of the internet • define the term the internet • describe how the internet is used for communication (including: IM, VOIP and news services) • discuss the benefits and drawbacks of using the internet • define the term World Wide Web • discuss the difference between the internet and the World Wide Web • discuss the advantages and disadvantages of mobile networks	Give learners a table with various characteristics of the internet and World Wide Web. Learners tick which statements they think applies to each. They could apply to more than one. **(I) (H)** For example: <table><tr><td>**Statement**</td><td>**Internet**</td><td>**World Wide Web**</td></tr><tr><td>A network of networks</td><td></td><td></td></tr><tr><td>Uses the HTTP protocol</td><td></td><td></td></tr><tr><td>Includes LAN, WAN, email, FTP, mobile</td><td></td><td></td></tr></table> Give learners a scenario such as the following: You are a freelance journalist. You need to find the most interesting and up-to-date stories that are going on in the world. In order to do this you will need to use various methods of communication such as: • Instant messaging (IM) • Voice over Internet Protocol (VOIP) • News services • Mobile networks Explain how you make use of each of the methods of communication and what benefits and drawbacks you encounter in doing so. **(I) (H) (F)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
6.2 **Key concept: Impact of Information Technology** **Key concept: Hardware and software** **Key concept: Network**	**Video and web conferencing** • describe how to set up a video conference • describe how to set up a web conference • describe the use of networks in video and web conferencing (including: Integrated Services Digital Network (ISDN), LAN, WAN, VPN, 802.11 a/b/g/n (wireless), Asynchronous Digital Subscriber Lines (ADSL), Synchronous Digital Subscriber Lines (SDSL), 3G/4G mobile networks) • discuss the impact of video conferencing on society (including: the general public, legislation, education, medicine, business, media) • describe how data is transmitted and converted in a video conference (including: use of codecs)	Divide the class into groups (e.g. Group A, Group B, Group C, Group D) and give each group a different subset of the networks and technologies used in conferencing, so that all those listed are covered. Give the groups a set time to research, and become 'experts' in, their technologies. **(G)** Change the groups around, so that they consist of a learner from each group (i.e. new Group 1 has learners from A, B,C,D). Learners share their expertise with the rest of the group, so that all learners know about all the networks and technologies. **(G) (F)** In pairs, learners produce an interactive guide for a business that wants to start using video and web conferencing. The guide should include the following: • How to set up a video conference • How to set up a web conference • How data is transmitted in conferences • How different networks can be used in conferences • How mobile technologies can be used in conferences The guide should include a mixture of text, images and interactive elements. At least two multimedia elements should be included. **(P) (F)** The following could be used as research: http://www.itbusiness.ca/news/how-to-set-up-an-awesome-video-conferencing-system/15440 http://www.bbc.co.uk/schools/gcsebitesize/ict/implications/2workpatternsrev6.shtml https://en.wikipedia.org/wiki/Videoconferencing

Expert systems (AS Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
7 **Key concept: Hardware and software** **Key concept: Network**	• describe the components of an expert system • explain how the components of an expert system produce possible solutions • explain how an expert system can be used by organisations • describe the terms backward chaining and forward chaining • explain the use of master and transaction files (including in: payroll and customer orders) • analyse the different types of processing and their uses (including: batch, online, real processing)	Get learners using an example of an expert system such as the following: http://symptoms.webmd.com/default.htm#introView (The link is a system that allows a user to input health issue symptoms and it will give the user a diagnosis.) Ask learners how they think the system is able to give the diagnosis. What does it need to be able to do that? Lead the discussion into identifying the component parts of an expert system. Expand this discussion into looking at how expert systems can be used in other ways and what kind of organisations would benefit from using them. **(W)** Give learners a worksheet that has four descriptions of businesses and the information that they need to process. Learners need to identify which processing system would be best for the business to use. **(I) (H) (F)** These websites have information about processing systems: http://www.teach-ict.com/as_a2_ict_new/ocr/A2_G063/332_designing_systems/processing_methods/miniweb/index.htm http://www.webopedia.com/TERM/B/batch_processing.html

V1 20

Spreadsheets (AS Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities

8.1
 	
Key concept: Hardware and software
	Create a spreadsheet
	
	• create structure
	  – explain the purpose of cells, rows, columns, ranges, worksheets and multiple worksheets in a single data file
	
	  – insert a row and a column, delete a row and a column, resize a row and a column, hide a row and a column
	
	  – manipulate cells and their content (including: date and time functions; extracting numeric values from strings, concatenating cell content, protecting: cells, rows, columns, worksheets and multiple worksheets in a single data file)
	
	  – adjust cell, row and column width and height
		The more practical sections of the syllabus are best carried out as part of a project, where each section builds an item that uses a business scenario. You can provide learners with an overall scenario of a certain business, or learners choose their own business.
		
		The scenario should require learners to cover the required skills, for example:
		
		A theatre company wants to start putting on productions in their own new theatre. They need to create a budget for their productions, create a database to store and use customer's details, send out tickets to customers and advertise their shows using various methods.
		
		Learners build their own solutions or you could provide a file that they will need to edit.
		
		Learners start by setting up a spreadsheet budgeting system for the theatre. They discuss in pairs what kind of costs the theatre will incur and what they need to record on the spreadsheet (e.g. director's fee, name of actor, actors' fee per show, lighting, costumes) and the income into the theatre from productions and how they will record this (e.g. name of production, date(s), time, ticket price, number of seats). **(P)**
		
		Learners individually create one worksheet for the costs, putting headers and data into the worksheet, and another for the production income. In doing this, learners should demonstrate the following skills:
		
		• Resizing of rows and columns
		• Hiding of rows and columns
		• Protecting certain values
		• Creating a production ID number by extracting and concatenating data from the production details **(I)**
		
		Ask learners, from their experience of creating a spreadsheet, the purpose of the different elements (cells, rows, etc.). **(W)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities

8.1 continued	• create formatting
	  − format cells (including: date, time, text, numeric, currency, percentage, fractions, text orientation, alignment, conditional formatting)
	
	  − format cell emphasis (including: colour, shading, merge, borders, comments)
	
	  − format page (including: page setup, fit to page, margins, header, footer)
	
	• create formulae and functions
	  − explain the difference between a formula and a function
	
	  − use formulae (including: add, subtract, multiply, divide, indices)
	
	  − use absolute reference, relative reference, nested formulae, named cells, named ranges
	
	  − explain why absolute and relative referencing are used
	
	  − use functions (including: sum, average, minimum, maximum, integer, rounding, counting, IF, nested IF, lookup (including: vertical, horizontal), conditional formulae to include counting, sum, average)
		Learners then have to present their budgeting information clearly (e.g. to theatre management). This involves formatting and printing the spreadsheet they have set up. They should:
		
		• Set suitable data types for each cell
		• Demonstrate conditional formatting, e.g. highlighting productions with costs above, or below a certain figure
		• Demonstrate use of borders and shading
		• Demonstrate merging of cells
		• Insert a header and footer (e.g. theatre's contact details)
		• Demonstrate text alignment and orientation
		• Print the worksheet pages **(I)**
		
		Learners now need to use their spreadsheets to work out what profit the theatre would make on a production. This requires the use of formulae and functions.
		
		Give learners examples of formulae and functions, and elicit the difference between them. **(W)**
		
		Ask learners what would happen if the price of certain equipment increased, and use this to discuss lookup tables. **(W)**
		
		Learners then add formulae and functions to their spreadsheets to work out the profit. Examples of ideas for use of the formulae:
		
		• Lookup tables to input the cost of the equipment when it is selected for a production.
		• IF statements to see if a profit is made for a production. The criteria for the profit could range from high, mid, low, no profit etc.
		
		Learners should demonstrate the following:
		
		• +, -, *, /
		• SUM, AVG, MIN, MAX
		• IF's and Nested IF's
		• Lookups

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
8.1 continued	• use validation rules • test validation applied to a spreadsheet • test a spreadsheet model and evaluate the effectiveness of test plans for a spreadsheet model • verify and validate data entry • extract data – search using: text, numeric, date, time, Boolean operators (AND, OR, NOT), >, <, , =, .>=, ,<=, contains, starts with, ends with • sort data (including: ascending, descending) on multiple columns import and export data (including: .csv, .txt, .rtf, graphs and charts)	• Rounding • Counting **(I)** Learners now add validation rules to their spreadsheets to make sure the data entered is sensible. Learners should demonstrate at least two different methods of data validation to improve the accuracy of the data in their spreadsheet. **(I)** Learners swap their spreadsheets in pairs, and try to enter incorrect data, to test the validation rules. They also add some incorrect data that passes the validation rules. They swap the spreadsheets back, and learners visually check the data, and improve their data validation rules, if possible. **(P) (I)** Learners create a way to sort data on multiple columns in their spreadsheet, for example, to sort productions by category of show, then decreasing cost. When a new item is added to the table the data may need to be sorted into a certain order again.

8.2 **Key concept: Hardware and software**	**Graphs and charts** • analyse and select the most appropriate type of graph or chart (including: bar chart, pie chart, line graph, comparative bar chart, comparative line graph) • create a graph or chart (including: appropriate data series, from contiguous data, from non-contiguous data, specified range(s)) – label a graph or chart (including: title, legend, segment labels, segment values, percentages, category axis labels, series labels, value axis labels, scales, set axis scale maximum, set axis scale minimum)	• Show learners examples of the different types of graphs and discuss what type of data they are most suitable for. **(W)** • Learners incorporate a graph into their spreadsheet using data about the costs of each production. For example, learners create a graph for a number of productions to show the cost of the production versus the profit made if 500 tickets are sold. They decide the best type of graph to use to show the cost and profit (for example, a bar chart for the costs with a line graph incorporated to show the profit), and label their graphs. • Learners also create a graph or chart to show the proportion of different costs (actors, equipment etc.) that make up the total cost of production. **(I)**
8.3 **Key concept: Hardware and software**	**Modelling** • describe the characteristics of modelling software • analyse the need for computer models • evaluate the effectiveness of spreadsheet models (including for: financial forecasting)	• Learners use the spreadsheet they have created to model the cost of the different productions. They can look at things such as which productions would make the most profit, what effect ticket sales will have, adding in more props to make the production more exciting, reducing/ increasing the costs of refreshments etc. **(I)** • Discuss with learners the benefits to the theatre company of using a budgeting system and model. (For example, it will allow them to see how much they can afford the cost of a production to be, how many tickets they need to sell to make a high level of profit.) Also discuss the limitations of the budgeting systems learners have created, and what they will not allow them to model. **(W)**

| 8.4 **Key concept: Impact of Information Technology** **Key concept: Hardware and software** | **Simulations**

• describe the advantages and disadvantages of using a model to create and run simulations

• evaluate the use of simulation (including for: natural disaster planning, pilot training, car driving, nuclear science research) | Groups of learners research and evaluate the use of models and simulations in one of the four areas described in the objective, so that each of the applications is covered by at least one group. For their application, they should identify:

• Applications and uses of modelling and simulation (such as prediction, testing different scenarios, practice)
• Advantages of being able to model situations
• Disadvantages of modelling
• Advantages of using simulations
• Disadvantages of using simulations **(G)**

For example, they could research the 2004 Indian Ocean tsunami, and why modelling did not prevent the devastating consequences. The following website could be used for research:

https://www.dosomething.org/facts/11-facts-about-2004-indian-ocean-tsunami

Summarise the findings from the different groups with a class discussion. **(W)** |

Database and file concepts (AS Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
9.1 **Key concept: Impact of Information Technology** **Key concept: Hardware and software**	**Create a database** • assign a data type and an appropriate field size to a field (including: text, alphanumeric, numeric (integer, decimal), date/time, Boolean) • describe the three relationships: one-to-one, one-to-many and many-to-many • create and use relationships (including: one-to-one and one-to-many) • create and interpret an entity relationship diagram • evaluate the difference between a flat file and a relational database and why one might be preferred in certain situations	The more practical sections are best carried out as part of a project where each section builds an item that uses a business scenario. You can provide learners with an overall scenario of a certain business, or learners choose their own business. The scenario should require learners to cover the required skills, for example: A theatre company wants to start putting on productions in their own new theatre. They need to create a budget for their productions, create a database to store and use customers' details, send out tickets to customers and advertise their shows using various methods. Ask learners for examples of one-to-one, one-to-many and many-to-many relationships that might exist in their databases. **(W)** Learners discuss in pairs the fields and relationships needed in a database to store customer details, production details and ticket sales for shows. **(P)** They then work individually to create the database. In setting up the database they should demonstrate the following: • Giving each field a suitable data type and size • Creating relationships between tables • Providing an entity relationship diagram for their database **(I)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities

9.1 continued	• create a relational database
	
	• analyse the function of key fields (including: primary key, compound key, foreign key)
	
	• set keys (including: primary key, compound key, foreign key)
	
	• define and use referential integrity and explain its importance
	
	• validate and verify data entry
	  – use validation rules (see 1.5)
	  – test validation applied to a database
	  – verify data entry (see 1.5)
	
	• perform searches
	  – simple query on single criterion
	  – complex queries using multiple criteria
	  – queries using static parameters
	  – queries using dynamic parameters
	  – nested queries
	  – summarise data (including: cross-tab query/pivot table)
	  – using text, numeric, date, time, wildcard, Boolean operators (AND, OR, NOT), >, <, =, >=, <=
		Learners then:
		
		• Create a primary key for each table
		• Set any foreign and compound keys keys that are needed in tables
		• Set validation rules to make sure the data entered is sensible and follows a set of rules. **(I)**
		
		In pairs, learners should test each other's validation rules by entering incorrect data of different types. They should also add data to their partner's database that passes the validation rules, but is inaccurate (e.g misspelled, or clearly not correct). Learners swap their databases back, identify the incorrect data, and improve the validation rules where possible. **(P)**
		
		[Note: discussion of static versus dynamic queries, and summary queries is covered in 9.4 'Query selection' below. You may want to include that activity here.]
		
		Once learners have entered a set of records they can then begin to perform searches on their database. Prepare a worksheet with a set of searches that learners should carry out, so that they practice the range of searches required, for example:
		
		• Find customers by forename and surname
		• Find customers that have seen more than three different shows
		• Find out, and summarise in a table, the popularity of different shows
		• Find all productions that children have attended, that are not solely aimed at children (children's shows). **(I)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
9.1 continued	• use arithmetic operations, numeric and logical functions to perform calculations within a database (including calculated controls and calculated fields) • sort data − ascending, descending, grouped • design, create and evaluate an appropriate data entry form (including: appropriate font styles and sizes, spacing between fields, character spacing of individual fields, use of white space, radio buttons, drop-down menus, highlighting key fields) • design, create and evaluate a switchboard/menu within a database • import data (including: .csv, .txt, .rtf) • export data (including: table, query, report, export as .csv, .txt, .rtf)	Learners create a data entry form that will allow a user to view/amend and enter new customer details and production details. In their data entry form, learners must demonstrate the use of: • Correct layout and use of space • Drop-down menus • Radio buttons Their form should also demonstrate use of calculations, such as calculating the total cost of their tickets and applying a discount if they meet certain criteria. **(I)** Learners create a menu system for their database, with buttons to access their different elements. Learners should use their searches in the previous activity to present reports on the productions, such as the top ten most popular productions, sorted in descending order of popularity and showing the numbers of people going; the average number of people attending different types of production, sorted in descending order of popularity etc. **(I)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
9.2 **Key concept: Hardware and software**	**Normalisation to third normal form (3NF)** • describe the characteristics of data in unnormalised form (0NF), first normal form (1NF), second normal form (2NF) and third normal form (3NF) • discuss the advantages and disadvantages of normalisation • normalise a database to 3NF	This is an excellent video to help walk learners through the process of normalisation: https://www.youtube.com/watch?v=fg7r3DgS3rA (NOTE: The resource that is used in the video is not now accessible but the video shows a good demonstration of the resource.) Use the following questions to prompt discussion: • Why is 3NF better than 2NF? • What are the advantages of normalisation? • What happens if we don't normalise? • Will any/every dataset normalise to 3NF? **(W)**
9.3 **Key concept: Hardware and software**	**Data dictionary** • describe the components of a data dictionary • select appropriate data types for a given set of data and a given situation • identify different data types (including: text, alphanumeric, numeric, (integer, real, percentage, currency), date/time, Boolean/logical (yes/no, true/false))	Learners create a data dictionary for their database of customer, production and ticket details. Learners should demonstrate all the components of a data dictionary on their own. **(I)** The following website provides information about the different components that can be included in a data dictionary: http://www.teach-ict.com/as_as_computing/ocr/H447/F453/3_3_9/ddl/miniweb/pg4.htm

9.4 **Key concept: Hardware and software**	**Query selection** • evaluate the use of static and dynamic parameters in a query (see 9.1) • analyse when static and dynamic parameters should be used in queries (see 9.1) • analyse when simple, complex, nested and summary queries (including cross-tab queries/pivot tables) should be used (see 9.1)	Discuss with learners the advantages and disadvantages of creating a dynamic query or a static query. Ask learners when they would create a static query rather than a dynamic query. Discuss the use of cross-tab queries and pivot tables. **(W)** The following website provides information about the use of different types of queries: http://www.teach-ict.com/as_a2_ict_new/ocr/AS_G061/315_database_concepts/queries/miniweb/index.htm
9.5 **Key concept: Hardware and software**	**File and data management** • evaluate different file types and their use • explain what is meant by proprietary and open-source file formats, and why open-source file formats are needed • explain why generic file formats are needed • explain the use of indexed sequential access • explain the use of direct file access • explain the use of a hierarchical database management system	Discuss with learners the advantages and disadvantages of the various database file types. You should include proprietary types such as Access (.accdb, .mdb) and Filemaker (.fmp), generic such as .csv, .txt and .rtf and open source such as .odb. **(W)** Indexed sequential access and hierarchical databases can be discussed with learners in relation to the more common use of relational databases. Ask learners to discuss the strengths and weaknesses of each of these. **(W)** The following websites provide information about the advantages and disadvantages (in comparison with relational databases) of indexed sequential access and hierarchical databases: http://www.techrepublic.com/article/explore-the-differences-between-isam-and-relational-databases/ http://www.teach-ict.com/gcse_new/databases/flatfile_relational/miniweb/index.htm https://www.techopedia.com/definition/19782/hierarchical-database

| 9.5 continued | • describe the features of a management information system (MIS)

• explain how a MIS can be used by organisations | Get learners to define a MIS and build up a class definition that all learners can agree. They should consider:
• Where the MIS might get information? – both internal and external information sources
• What is this information for and how might it be used? – its used by the organisation's management to help them make decisions. **(W)**

Ask learners to discuss the use of MIS within organisations:
• What types of organization use MIS? – schools, multinationals etc
• How do they use them? – supermarkets use them to help predict demand for products so that stock can be ordered and delivered ready for the expected demand (seasonal products etc.)
• Who uses them? – management, data analysts. **(W)**

The following website provides a basic description of an MIS and the potential uses across a range of different organisations:

http://www.teach-ict.com/as_a2_ict_new/ocr/A2_G063/334_applications_ict/mis/miniweb/index.htm |

Sound and video editing (AS Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities

10
 	
Key concept: Hardware and software
 	
Key concept: The internet
	• edit a video clip to meet the requirements of its intended application and audience
	   – set an aspect ratio
	   – trim a video clip to remove unwanted footage
	   – join together video clips
	   – create text based slides
	   – create credits
	   – add captions and subtitles
	   – add fading effects
	   – add animation effects
	   – extract a still image from a video clip
	   – insert a still image
	   – add sound to a video clip
	   – remove sound from a video clip
	   – alter the speed of a video clip
	   – export a video clip in different file formats
	   – compress a video to different resolutions to suit different media (including: DVD, internet)
	
	• describe how typical features found in video editing software are used in practice
		The more practical sections of the syllabus are best carried out as part of a project where each section builds an item that uses a business scenario. You can provide learners with an overall scenario of a certain business, or learners could choose their own business.
		
		The scenario should require learners to cover the skills required, an example is set out below:
		
		A theatre company wants to start putting on productions in their own new theatre. They need to create a budget for their productions, create a database to store and use customer's details, send out tickets to customers and advertise their shows using various methods.
		
		Learners create a video to advertise the theatre. You could provide users with three video clips of different productions that they need to incorporate in their advertising video e.g. 'We perform shows such as…(learners use the video clips here)'. Learners should demonstrate as many of the skills in the learning objectives as they can in creating their video. **(I)**
		
		The sound added could be a voiceover for their advert that they create in the sound editing part of the module. When the video and sound editing are finished, learners will watch the videos and give feedback.
		
		Learners provide a guide to video editing features and what they can be used for, aimed at learners new to video editing. **(I) (H)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities

10 continued	• edit a sound clip to meet the requirements of its intended application and audience
	   – trim a sound clip to remove unwanted material
	   – join together two sound clips
	   – fade in and fade out a sound clip
	   – alter the speed of a sound clip
	   – change the pitch of a sound clip
	   – add or adjust reverberation
	   – overdub a sound clip to include a voice over
	   – export a sound clip in different file formats
	   – compress (including: the use of MP3) the sound file to different sample rates to suit different media
	
	• describe how typical features found in sound editing software are used in practice
	
	• describe how file sizes depend on sampling rate and sampling resolution
		Learners create a voiceover for their advertisement. They will need to balance their voiceover over a soundtrack for their advert. They must demonstrate as many skills as they can from the learning objectives.
		
		Learners watch each other's videos, and give feedback on each of the editing skills – things that went well, and things that could be improved. **(W) (F)**
		
		Discuss with learners what happens to the quality of their sound track if they set a higher or lower sampling rate. Look at why this gain/loss in quality occurs. **(W)**
		
		Learners provide a guide to sound editing features and what they can be used for, aimed at learners new to sound editing. **(I) (H)**

Emerging technologies (A Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
11 **Key concept: New Technologies**	• describe emerging technologies (including: 3D printing, 4G and 5G cellular communications, artificial intelligence, augmented reality, biometrics, cloud computing, computer-assisted translation, holographic and 4th generation optical data storage, holographic imaging, quantum cryptography, robotics, QR codes, wearable computing, ultra-high definition television (including: 4K resolution screens) vision enhancement, virtual reality, and their possible uses in different fields, (including: medicine, manufacturing, space exploration)	Split learners into pairs. Give each pair two sections from the emerging technologies list in the learning objectives. Learners need to research at least one emerging technology, preferably two, from each category they are given. Ask learners to create a podcast for their peers about the emerging technologies, including the following information **(P) (F):** • What is the technology? • How does it work? • What will it be used for? • What impact will it have? Learners should use their sound editing skills to edit their podcasts.

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
11 continued	• evaluate the impact of emerging technologies on individuals and their lifestyles (including: smartphones performing many of the tasks that PCs and laptops perform) • evaluate the impact of emerging technologies on organisations • evaluate the impact of emerging technologies on medicine (including: development of prosthetics and medical products, tissue engineering, artificial blood vessels and the design of medical tools and equipment) • evaluate the impact of emerging technologies on the environment • discuss the advantages and disadvantages of storing data in the cloud	Learners listen to each other's podcasts. They should create a report that, from listening to the podcasts, highlights the three emerging technologies they think are likely to have the most impact on: • their own and others' lifestyles • organisations • medicine • the environment. In the report they should also explain why they think the technologies they choose will have the most impact. **(I) (H) (F)** Ask learners how many of them store their data in a cloud system. If there are any learners that do, ask them why they do this. It may be that they don't understand why, or they could have a very good reason for doing so. Ask those learners that don't use a cloud system to consider what might make them want to use one. Ask them what is stopping them using one. It may be that they simply don't know how to use one, or they may have a very valid reason, e.g. security, as to why they don't use a cloud-based system. **(W)**

Role and impact of IT in society (A Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
12.1 **Key concept: Impact of Information Technology** **Key concept: The internet**	**E-business** • evaluate the impact of information technology on e-business (including: banking, shopping, trading goods) • describe how it is possible to be subjected to fraud when using credit cards online • evaluate the impact of digital currency (including: Bitcoin, Litecoin)	Hold a discussion about how much online shopping learners and their families do. Then ask learners to consider what would happen to shopping habits for both people and organisations if online shopping was no longer permitted or available. **(W)** Discuss: • Would anything be easier? • Would anything be more difficult? • What would be the alternatives? • What impact would it have on fraud? • Would it be a good thing? These same questions could also be discussed for online banking and trading goods. Ask learners to research digital currencies and then create an info-graphic to help their peers understand what they are and the benefits and drawbacks of using them. **(I) (F)** The following sites could be used for research: http://www.wsj.com/articles/the-revolutionary-power-of-digital-currency-1422035061 http://www.techrepublic.com/article/10-things-you-should-know-about-bitcoin-and-digital-currencies/ http://www.coindesk.com/what-other-digital-currencies-are-there/

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
12.1 continued	• explain how IT is used in e-business (including: electronic funds transfer, automatic stock control, electronic data exchange, business-to-business buying and selling, online stores) • discuss how organisations mine data to analyse social and economic trends	Demonstrate the following activities using an appropriate website (such as Amazon, eBay or Alibaba): • Price comparison – being able to use the internet to seek out the lowest prices for items or services. • Steps when buying online – browsing product categories, putting items into a virtual shopping cart, going to the checkout, confirm the order and logging out • Means of payment – there are several methods that online shoppers commonly use • Security issues – how user and payment data are encrypted and the issue of privacy of personal information. As there are ethical problems with allowing learners to set up accounts, it is better to demonstrate selling by setting up a dummy account of your own (first set up a dummy email account). You can then show learners how systems work. Online transactions are now available in many ways. In the UK people can pay their car tax, their council tax, parking fines and many more.
12.2 **Key concept: Impact of Information Technology** **Key concept: Network**	**Social networking** • evaluate methods used for social networking (including: chat rooms, instant messaging, forums, email, blogs, microblogs) and their impact on changing social patterns	Prepare a table with the different types of social networking, and characteristics, such as: Number of people reached (one-to-one/one-to-many/many-to-many); Ease of use; Ease of access; Privacy; Checking people's identity. Learners work in pairs to fill in the table for each type of social networking. **(P)** Use the tables as the starting point of a discussion of the advantages and disadvantages of different methods. **(W)** Discuss with learners how their life would be different if they had no access to online social networking. Consider: **(W)** • How would their life be different? • Would it free up any more time in their day? • How would this change their social interactions with their friends? • How would they find out what their friends are/have been doing? • How would they feel about this? • How would they contact their friends? • Would their life be better or worse? Why? This is an interesting article about social networking and its effects: http://www.humankinetics.com/excerpts/excerpts/technology-can-have-positive-and-negative-impact-on-social-interactions

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
12.3 **Key concept: Impact of Information Technology** **Key concept: Hardware and software** **Key concept: Network**	**Video conferencing and teleworking** • describe video conferencing and the hardware and software used • describe web conferencing and the hardware and software used • discuss the advantages and disadvantages of video conferencing on employers and employees • discuss the advantages and disadvantages of web conferencing on employers and employees • describe teleworking • discuss the effects of teleworking on employers and employees	Much of the start of this section is covered in the AS video/web conferencing section. Discuss with learners what benefits would be added to a meeting if the participants were able to work from their own office/home, using video conferencing software and hardware to have a meeting. Consider: • What would this allow compared to participants travelling, in order to have the meeting face-to-face? • What will this allow compared to each participant talking to another in individual telephone conversations? • What difficulties can arise if video conferencing is used? What impact could this have? • Would anything be made easier/more difficult compared to a face-to-face meeting? • Are video conferences better/worse for both the employee and the employer? Ask learners to speak to a parent/sibling/family member/family friend who currently works in an office. Get them to discuss with this person how their job and their life would change if they were able to do their job from home each day. Ask them to find out what the person would need to do their job from home each day, rather than in the office, (e.g. hardware, software, equipment, power) and what they would gain. Ask them to find out what impact this might have on both the person and also the business that they work for. Ask the learner to evaluate whether they think teleworking for their person would be a positive or negative option and include reasons why. **(I)(F)** The following websites contain information about teleworking: http://www.bbc.co.uk/schools/gcsebitesize/ict/implications/2workpatternsrev5.shtml http://www.webopedia.com/TERM/T/teleworking.html http://www.teach-ict.com/gcse_new/work_employment/teleworking/miniweb/index.htm

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
12.4 **Key concept: Impact of Information Technology**	**Technology in society** • evaluate the impact of information technology on society (including: sport, manufacturing, medicine, education, banking, e-business)	In groups, learners create a video titled 'The Changing Face of Technology in Society'. Give each group a different area to work on e.g. sport/manufacturing etc. They should include: • A history of the introduction of technology into their area • The development of the use of technology in their area • What benefits different technologies have brought about in their area • What drawbacks technology has brought about in their area • What emerging technologies are currently under development in their area **(G) (F)** The following is an article that raises some interesting points about technology in society: http://www.newyorker.com/tech/elements/as-technology-gets-better-will-society-get-worse
12.5 **Key concept: Impact of Information Technology** **Key concept: New technologies**	**Technology enhanced learning** • discuss the advantages and disadvantages of software-based training methods • evaluate the impact of technology on learning (including: Massive Open Online Courses (MOOC), computer based training, online tutorials, video conferencing)	Discuss with learners how learning has changed with the introduction of software based training methods, MOOC, video sites for tutorials and video conferencing. The discussion could include: • What technology based learning methods are available to learners? • What are the features of these methods? • What benefits do these methods create for learners? • What benefits do these methods create for businesses? • What drawbacks do these methods have? **(W)** The following websites could be used for research: http://smallbusiness.chron.com/five-positive-effects-technology-education-31222.html http://www.teachhub.com/how-technology-changed-learning http://www.teach-ict.com/as_a2_ict_new/ocr/A2_G063/334_applications_ict/training_methods/miniweb/index.htm http://mooc.org/ https://en.wikipedia.org/wiki/Massive_open_online_course

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
13.1 **Key concept: Network**	**Network components** • describe the role and operations of the following components in a network: switches, hubs, wireless access points, network interface cards, wireless network interface cards, routers, repeaters, gateways, bridge, firewalls (hardware and software) and servers • describe bandwidth • describe bit rate • describe bit streaming (both real time and on demand) • discuss the importance of bit rates/broadband speed on bit streaming • describe packet switching, circuit switching and message switching	Make up, for pairs of learners, two sets of cards; one in which each card contains a list of network components and one in which each card contains a description of the role of each network component. Learners match the terms to the correct roles performed. **(P) (F)** Give learners a network diagram with the components (unlabelled). Learners talk through how data is sent from a computer to a server across a network, taking turns to describe each component the data passes through. They label the components on the diagram as they describe their function. **(P) (F)** Go through the diagram as a class, to check learners' understanding. This website could be used for information: http://www.teach-ict.com/as_a2_ict_new/ocr/A2_G063/333_networks_coms/network_components/miniweb/index.htm Discuss with learners how data is transmitted with reference to packet switching, circuit switching and message switching. Develop this into the importance of bit rate and bandwidth when transmitting and streaming data. **(W)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
13.1 continued	• describe optical communication/transmission methods (fibre optic, laser), their advantages, disadvantages and their typical applications • evaluate wireless communication/transmission methods (including: Bluetooth, infrared, WiFi, radio), their advantages, disadvantages and their typical applications • explain the importance of bandwidth and bit rate when transmitting data • analyse how different types of communication/transmission media (cables, wireless, optical) govern the bandwidth available for transmitting data • describe what a protocol is and different types of protocols (including: Wide Area Network protocols and Local Area Network access protocols) • describe how the BitTorrent protocol provides peer-to-peer file sharing	Ask learners to create a presentation comparing the use of different optical and wireless communication methods. Ask learners as part of their presentation to include at least two examples (one optical, one wireless) of a practical application of the technology. **(I)(F)** These websites could be used for research: http://www.teach-ict.com/as_a2_ict_new/ocr/A2_G063/333_networks_coms/optical_wireless/miniweb/index.htm http://www.elprocus.com/types-of-wireless-communication-applications/ https://www.techopedia.com/definition/24942/optical-communication

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
13.2 **Key concept: Impact of Information Technology** **Key concept: Hardware and software** **Key concept: Network**	**Network security** • describe the security issues that could arise from networking computers • explain how security issues can be prevented on a computer network • evaluate a range of physical and software based security methods for a computer network • list the principles of a data protection act • analyse the need for a data protection act • evaluate methods for combating IT crime (including: physical security methods, biometric methods, firewalls, back-up, encryption, access rights, malware security, anti-virus, anti-spyware)	Discuss with learners the kind of network you are likely to have in your school. Include the following in the discussion: • What possible security issues need to be considered? • What does the school need to do to prevent these security issues from arising? • What physical security methods does the school have in place? • What logical (software based) security methods does the school have in place? • What could the school introduce to make its network even safer? **(W)** Ask learners to research a case that involved IT crime. For each of the security methods listed, they should evaluate how effective they would have been at preventing the crime from taking place. **(I)** Ask learners to write a guide for their peers to explain what the data privacy or protection law that is enacted in their country is (such as the Data Protection Act 1998 in the UK) and how it protects their data. They should include: • A list of the principles of the Law/Act • What rights they have under the Law/Act • An explanation of why the Law/Act is necessary. The following could be used for research: http://www.bbc.co.uk/schools/gcsebitesize/ict/legal/0dataprotectionactrev1.shtml

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
13.3 **Key concept: Impact of Information Technology** **Key concept: Hardware and software** **Key concept: Network**	**Satellite Communication Systems** • describe how Satellite Communication Systems are used and work in data transfer systems, television and radio broadcasting systems and global positioning systems (GPS) • discuss the advantages and disadvantages of using satellites for data transfer systems, television and radio broadcasting systems, and GPS	Discuss with learners why satellites are used in communication, including what they enable in terms of communication that usual networks are not suitable for. **(W)**

Project management (A Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
14.1 **Key concept: System life cycle**	**Stages in project management** • describe the stages of project management from project conception to project close	Introduce the need for project management by asking learners what constraints there are when implementing a project. (They should come up with time, money, resources such as people, equipment etc.) Also discuss what can go wrong in a software project. **(W)** Ask learners to create a diagram that represents the different stages of project management. **(I) (F)**
14.2 **Key concept: System life cycle**	**Types of project management** • discuss the types of project management software and the advantages and disadvantages of each type	Learners work in pairs to investigate the different types of project management software (desktop, web-based, client-server, integrated). They should evaluate each type of software in terms of characteristics such as: • Multiple / single user • Ease of access • Hardware/software required • Interface • Particular features **(P)** Learners identify what type of project/organisation each type of software would be most suitable for, and why (e.g. as a table). **(I) (H)**

14.3 **Key concept: Hardware and software** **Key concept: System life cycle**	**Project management software** • explain how project management software is used (including: planning, scheduling of tasks, allocation of resources, costings, communications, decision-making)	Provide learners with examples (such as completed Gantt charts) of project management software. With reference to the initial discussion on project management, discuss what uses they can identify. These should include: how it is used as a planning tool, how it is used to allocate resources, how it is used to allocate costs and how it enables and informs the decision-making process. **(W)**
14.4 **Key concept: System life cycle**	**Critical path analysis** • describe, interpret and create a critical path analysis	Give learners a list of tasks that are required for a project, along with a timescale for each task and any dependencies they have. Ask learners to find the critical path through the use of critical path analysis. **(I) (F)** This website can help with the process: http://www.teach-ict.com/as_a2_ict_new/ocr/A2_G063/331_systems_cycle/planning_tools/miniweb/pg6.htm
14.5 **Key concept: System life cycle**	**Gantt charts** • describe, interpret and create a Gantt chart	Give learners a list of tasks that are required for a project, along with a timescale for each task and any dependencies they have. Ask learners to create a Gantt chart for the project. **(I) (F)** This website can help with the process: http://www.teach-ict.com/as_a2_ict_new/ocr/A2_G063/331_systems_cycle/planning_tools/miniweb/pg3.htm

14.6 **Key concept: System life cycle**	**Disaster recovery management** • describe disaster recovery management (including: risk analysis, perpetrator analysis, risk testing, quantifying the risk, securing the risk, software protection, password controls, recovery management)	Discuss with learners what disasters can happen when using technology and the impact on a project. Discuss how the possibility of a disaster can be planned for and why this might be important. **(W)** The following could be used for information: http://whatis.techtarget.com/definition/disaster-recovery http://www.ready.gov/business/implementation/IT
14.7 **Key concept: System life cycle**	**Prototyping** • describe prototyping • describe types of prototyping (including: evolutionary, incremental, throw-away, rapid) • discuss the advantages and disadvantages of prototyping • describe Rapid Application Development (RAD) and other methods of software development (including: the conventional 'waterfall' method) • discuss the advantages and disadvantages of rapid application development (RAD)	Discuss with learners when the use of RAD would be a better method of development than the common waterfall method of development. **(W)** Develop the discussion to include the use of prototypes in development, the different types that can be created and how the use of the prototypes can change the development process. **(W)** The following websites could be used for information: http://www.teach-ict.com/as_a2_ict_new/ocr/A2_G063/331_systems_cycle/prototyping_RAD/miniweb/index.htm http://searchmanufacturingerp.techtarget.com/definition/prototype http://searchcio.techtarget.com/definition/Prototyping-Model

14.8	**CAD/CAM**	Ask learners to briefly research some uses of CAD and CAM. They should find at least two examples of each. **(I)**
Key Hardware and software	• evaluate the use of computer-aided design (CAD) and computer-aided manufacturing (CAM)	Discuss with learners how CAD and CAM have changed the creating of products and manufacturing. Discuss what businesses had to do before CAD/CAM was available. Ask learners what benefits CAD/CAM has brought about as well as any drawbacks. **(W)**
Key concept: System life cycle	• describe the uses of computer-aided design (CAD) and computer-aided manufacturing (CAM)	
	• discuss the benefits and drawbacks of using computer-aided design (CAD) and computer-aided manufacturing (CAM)	

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
15.1 **Key concept: System life cycle**	**Analysis** • analyse and evaluate different methods of researching a situation (including: questionnaires, interviews, observation, document analysis) • describe the content of the requirements specification, system specification and design specification	Explain that there are different methods of researching a situation including: questionnaires, interviews, observation, and document analysis. Perhaps have a number of tests that have been done by your learners over the last four/five weeks. It might simply be a number of pieces of paper which have question numbers and the marks awarded for each question. A group of learners could simply transfer the marks for each question to a notebook (paper based) and add up the totals for each learner. This could be divided up so that some learners would record the marks and others would total up the marks and calculate a percentage. Set up your activity so that a pair of learners records data while observing the group recording marks and calculate totals and percentages. **(P)** Ask a pair of learners to look at the test papers and the notebook containing the record of individual test marks and calculated totals and percentages. They will need to record what these documents look like and what information they contain. **(P)** Another pair of learners can devise a questionnaire (keep it brief!) asking the group what documents they deal with and also what results they produce. In addition get them to ask questions about what sort of computer system the group would need to make the job easier. **(P)** Ask another pair of learners to produce an interview 'script'. Allow them time to interview some of the group. They need to find out what data goes into and out of the system and what processing takes place. They should also ask questions about what sort of computer system the group would need to make the job easier. **(P)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
15.2 **Key concept: System life cycle**	**Design** • identify a flow of data through a system and create a data flow diagram (DFD) and a system flowchart	Learners use the results of their analysis to define the inputs, outputs and processing in the existing system. **(I)** **Identify the sources and volume of input data and collection methods** By examining all the documents, this will enable the systems analyst to identify the documents which are currently being used to input data to the existing system. Observation will enable the systems analyst to determine the frequency of the addition and/or deletion of records. Identify manual and computer procedures necessary to achieve the current output. As a class, compare the diagrams and charts obtained from different analysis methods, and discuss the reasons for any differences. **(W)** **Identifying problems with the current system** Observations, examination of documents, questionnaires, interviews all contribute to the creation of DFDs which will help the systems analyst to identify current problems. Ask your learners to identify any problems with the current system. **Identifying suitable hardware and software for a new system** Analysing required outputs, storage and processing requirements using the DFDs will allow the Systems Analyst to make generalised recommendations for the software and hardware. Your learners should be able to identify the need for types of software and hardware needed – tell them not to be specific. They do not need to say what type of printer (that will be done at the design stage) just that a printer will be needed. Ask them to list the hardware and software they think will be needed. **Identifying the user and information requirements** Collating the interview transcripts, questionnaires and documents will enable the systems analyst to identify what the user requires and what information the system will require. This presentation from slide 13 onwards can be used in demonstration of the above tasks: www.auburn.edu/~fordfn1/wh7cls06.ppt

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
15.2 continued	• design and evaluate data collection forms and screen layouts • design and evaluate validation routines • create a data dictionary for a given situation • evaluate suitable hardware and software for a new system	**Designing data collection forms, screen layouts** These will depend on the user requirements as well as output required from system and file structures. Explain how to use the research data to determine what the data collection forms and screen layouts will look like – they will need to jump to the section on designing file structures to help them. Without knowing the fields, field types and lengths they will not be able to design the forms and layouts. **Designing report layouts and screen displays** The content and presentation of reports, layouts and screen displays will depend on the requirements of the users. Learners may have to go back and make sure they have all the information they need from the users to design these. **Designing validation routines** The form of input and file structures will determine these. Although not many resources on systems analysis mention the need to design these they are very important. The learners will need to identify the field type and length in order to do this. **Designing the required data/file structures and programming specifications** The data structures and programming will depend on the types of processing and input and output structures. Ask your learners to produce a file structure to match the data they are going to use. **Specifying the required hardware and software** Volume of data will determine the choice of output devices. The order that data will be output will affect choice of storage devices.

15.3	**Development and testing**	**Creating data structures, program modules**
		Having completed the design stage the need is for the actual data and file structures and any program modules to be created. Ask your learners to actually create these for the simple system described above. Explain that they are not expected to create program modules themselves but in real life this would happen.
Key concept: System life cycle	• describe the purpose of test data	
	• explain the purpose of alpha testing	**Testing strategies**
		Explain to your learners that they can do this using their simple system.
	• explain the purpose of beta testing	Each module will need to be tested with different types of test data, which you can ask your learners to do.
	• analyse the difference between alpha testing and beta testing	Types of test data to be used are:
		• normal data – data which is acceptable and will not generate error messages.
	• explain the purpose of black box testing	• live data – data which is already being used in the existing system. Ask your learners to use data they had already used i.e. the test scores and calculations.
	• explain the purpose of white box testing	• abnormal data – data which is outside acceptable ranges or is of the wrong data type.
		• extreme data – data which is at the extreme boundaries of a range.
	• analyse the difference between black box testing and white box testing	The system will also need to be tested as a whole. In this simple system the whole system is no more than a single module in real life so you will need to explain how the system could be expanded and how the whole thing would need testing. Explain how other modules might involve the use of mock exam results and calculating grades, the use of attendance records for each learner etc.
	• explain the importance of testing and having a test plan	
	• describe how a test plan is created	
	• create a test plan for a given situation	

15.3 continued		**Improvements that could be needed as a result of testing**
		Prior to the implementation, any improvements which might be needed are made to the system in the light of the testing of the system. These could be amended data structures or even amended program modules. It could also be amending validation rules. If a range check did not work properly it might be because the range values were not set properly.
		Explain how the validation rule for a test out of 50 would be 0<=x<=50 but if the = sign is omitted 50 and 0 (which are acceptable data) would be rejected. The learners would need to ensure that the = sign had been included.
15.4 **Key concept: System life cycle**	**Implementation** • describe the different methods of implementing a system (including: parallel running, direct changeover, phased implementation, pilot implementation) • analyse the suitability of an implementation method for a given situation	Discuss with learners how a new system might be introduced to replace an existing one. Would the old system just be replaced with the new one? What risks would this involve? What other methods could be used? Use the discussion to introduce the different methods of implementation. **(W)** **Parallel running** The existing system and the new system are run together until there are no mistakes with the new one. **Direct changeover** The existing system is replaced by the new one without any 'running in' period. **Phased implementation** This is parallel running on a small scale, where only part of the system is introduced to run alongside the existing system. When that works the next part or phase of the system is introduced. The existing system is gradually replaced by the new system. **Pilot running** The new system is operated in one area of the organisation only. Once it is working properly another area has it introduced. Provide learners with some example situations. For each situation, in pairs, they evaluate the advantages and disadvantages of each implementation method, and recommend the most suitable. **(P)** Discuss and compare answers as a whole class. **(W)**

15.5 **Key concept: System life cycle**	**Documentation** • design and develop elements of technical documentation • design and develop elements of user documentation • explain the need for technical and user documentation	Learners develop documentation for their system using the following descriptions: • Developing systems documentation (results of systems analysis, what is expected of the system, overall design decisions, test plan and test data). • Developing program documentation (description of the software, purpose of the software, input data formats, output, flowcharts, program listing, notes to assist future modifications).**(I)**
15.6 **Key concept: System life cycle**	**Evaluation and maintenance** • evaluate a new system in terms of efficiency, ease of use and meeting user requirements • explain the need for maintenance • explain perfective, adaptive, preventive and corrective maintenance	Explain that there are different ways a system can be evaluated: • Using test results to evaluate the solution – a comparison has to be made of the actual results together with the expected results. If the results are not as expected refinements may be needed. • Obtaining feedback from the user – for an effective system it would be expected that this would be positive. • The results of this evaluation are used to identify limitations of the system. Using these limitations, improvements can be made to the system.

Graphics creation (A Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
16.1 **Key concept: Hardware and software**	**Vector images** • create a vector image that meets the requirements of its intended application and audience – use layers to overlap items – use grouping or merging tools – use rotation and place an item – use transform tools to resize – use selection tools to select parts of an image – use crop tools to crop part of an image – use fill tools to colour items – use colour gradients – use node editing – fit text to a path – save an image in different file formats – compress an image to different resolutions using file formats (including: .jpg and .png) to suit different media file size requirements	The more practical sections are best carried out as part of a project. This way each practical section can build an item that uses the given scenario. Learners could be given a scenario, or learners could choose their own. The scenario needs to require learners to cover the skills required, for example: A theatre company wants to start putting on productions in their own new theatre. They will need to advertise their productions using various methods. Ask learners to create a logo for their project (the theatre company if they are using this). Ask learners to also create an advertising banner that could appear on a website. Learners should demonstrate as many of the skills as they are able from the learning objectives. **(I) (F)** Learners give feedback on each other's logos and banners – things that went well, and things that could be improved, on aspects such as: • use of colour • use of text • use of images • overall effectiveness as an advertisement. **(W)/(P) (F)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities

16.2
 	
Key concept: Hardware and software
 	
Key concept: The internet
	Bitmap images
	
	• create a bitmap image that meets the requirements of its intended application and audience
	  – use layers to overlap items
	  – use rotation and place an item
	  – use grouping or merging tools
	  – use selection tools to select parts of an image
	  – use crop tools to crop part of an image
	  – use masking tools
	  – use tools to improve parts of an image (including: blend, replicate, retouch)
	  – use tools to remove red eye
	  – use filters (including: blur, distort, sharpen)
	  – convert between colour, duotone and black and white images
	  – use colour gradients
	  – resize an image
	  – resize the canvas
	  – change the opacity of all or part of an image
	  – use text tools to include text
	  – save an image in different file formats
		Provide learners with three photographs of theatres (these could be internal or external images of a theatre). Ask learners to edit the bitmap images to enhance them and to create a collage of them together to use in their advertising. Learners should demonstrate as many of the skills as they are able from the learning objectives. **(I) (F)**
		
		Learners give feedback on each other's collages – things that went well, and things that could be improved, on aspects such as:
		
		• how original images have been combined (through overlapping, cropping etc.)
		• how original images have been improved
		• use of colour / duotone / black and white
		• overall effectiveness of collage as an advertisement. **(W)/(P) (F)**

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
16.2 continued	− compress an image to different resolutions using file formats (including: .bmp, .jpg, .png, gif to suit different media file size requirements) • describe the difference between a bitmap and a vector graphic • describe how typical features found in bitmapped and vector graphics software are used in practice • evaluate their suitability for a given scenario • evaluate the impact of image editing on society (including: media, advertising, fashion, shopping, politics, entertainment)	Discuss with learners the difference between a vector and a bitmap image and when each of them may be more suitable to use. What will affect this? **(W)** Ask learners to find an image on the internet that has been edited in some way. Make sure that across the class, images, from media, advertising, fashion and shopping are used. Ask learners to explain what editing they think has taken place. Ask them to describe why they think the image has been edited. Ask them to evaluate what impact they think the editing has had. **(I) (H) (F)**

Animation (A Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities

17
 	
Key concept: Hardware and software
	Animation
	
	• create and evaluate an animation that meets the requirements of its intended application and audience
	   – place objects
	   – place an image
	   – use frames
	   – set key frames
	   – use timings
	   – use layers
	   – show and hide objects
	   – resize objects
	   – use coordinates to move and place objects
	   – understand the use of tweening and what effect it creates
	   – use tweening (motion tweening) to create a smooth transition between frames
	   – use morphing (shape tweening)
	   – understand the use of morphing and what effect it creates
	   – use morphing to create a smooth transition between images
	   – add text
	   – change the opacity of objects and text
		The more practical sections are best carried out as part of a project. This way each practical section can build an item that uses the scenario. Learners can be given an overall scenario, or choose their own scenario.
		
		The scenario should require learners to cover the skills required, for example:
		
		A theatre company wants to start putting on productions in their own new theatre. They will need to advertise their productions using various methods.
		
		Ask learners to create an animation to use in the advertising of the theatre (if being used). The animation should be aimed at a younger audience and should show the features and benefits of the theatre that would appeal to a younger audience. Learners should demonstrate as many of the skills as they are able from the learning objectives. **(I) (F)**
		
		Learners watch each other's animations, and give feedback – things that went well, and things that could be improved, on aspects such as:
		
		• use of objects
		• use of text
		• smoothness of transition between frames
		• smoothness of transition between images
		• use of different opacities
		• suitability of animation for a younger audience
		• overall effectiveness of animation as an advertisement. **(W) (F)**

Mail merge (A Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities
18 **Key concept: Hardware and software**	**Mail merge** • create a master document structure (including: standard letter) • create a source file using appropriate software • link a master document to a source file, identifying and using correct field names, using conditional operators • set up fields for manual completion • create appropriate prompts to the user for manual completion • use the software to automatically select the required records • use manual methods and software tools to ensure error-free accuracy • perform mail merge using the master document and data sources • create variable fields to control record selection and omission when merging • explain why mail merge documents are created	The more practical sections are best carried out as part of a project based on a scenario. This way each practical section can build an item that uses the scenario. Learners could be given an overall scenario, or learners could choose their own scenario. The scenario needs to require learners to cover the skills required, for example: A theatre company wants to start putting on productions in their own new theatre. They will need to send out tickets to customers and advertise their productions using various methods. Provide learners with a database of customers and production details, or learners can use the database they built as part of the theatre project. They should create a master document that acts as a ticket and create a mail merge to merge the customer and production details onto the tickets to meet certain criteria set for the mail merge. **(I) (F)**

Programming for the web (A Level)

Syllabus ref and Key concepts	Learning objectives	Suggested teaching activities

19
 	
Key concept: Hardware and software
	Programming for the web
	
	• demonstrate a range of object-based programming techniques
	   – recognise data types (including: number, string, Boolean, array, object)
	   – assign and understand the term variables
	   – carry out calculations and basic string manipulation
	   – use arrays
	   – use comparison and logical operators
	   – use conditional statements (including: if, else, else if, switch)
	   – use loops (including: for, for/in, while, do/while)
	   – use iterative methods
	   – create functions
	   – trap errors
	   – control events
	   – create html forms to interact with the user
	   – add comments to explain JavaScript code
	
	• add interactivity to webpages
	
	• explain JavaScript terms and programming techniques
		The more practical sections are best carried out as part of a project based on a business scenario. This way each practical section can build an item that uses the business scenario. Learners can be given an overall scenario of a certain business, or choose their own business.
		
		The scenario needs to require learners to cover the skills required, for example:
		
		A theatre company wants to start putting on productions in their own new theatre. They will need to send out tickets to customers and advertise their shows using various methods.
		
		Learners should create a simple website structure in HTML to use for their project (the theatre if using). The video, animation and graphics created could all be added to the site. JavaScript should be used to create interactive elements for the site. Using the JavaScript learners should demonstrate as many of the skills as they are able from the learning objectives. **(I) (F)**