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## TOWARDS A STANDARD ICT CURRICULUM FOR LOWER AND UPPER SECONDARY SCHOOLS

*General Guidelines for Comprehensive Secondary Education*

UNESCO  
A Joint Collaboration between Cairo & Beirut Regional Offices

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# Towards a Standard ICT Curriculum for Lower and Upper Secondary Schools

*General Guidelines for Comprehensive Secondary Education*

**UNESCO**

*A Joint Collaboration between  
Cairo & Beirut Regional Offices*

**January 2003**

*This is a draft that is not intended for circulation or quotation until a final review is completed.*

*This curriculum is developed to serve the needs of UNESCO member states in the Arab region. Member states are free to adopt/adapt this curriculum to fit their specific needs.  
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## 1 General Curricula Goals

This specification covers the requirements of many specifications within the field of Information and Communication Technology (ICT). It provides opportunities for students to develop an awareness of the nature and importance of Information and Communication Technology in a rapidly changing society, and enables students to develop their application of knowledge, skills and understanding of Information and Communication Technology.

The assessment of candidates includes both practical capability using Information and Communication Technology and the knowledge and understanding which underpins this capability.

The specification is split into three levels: introductory, intermediate and advanced. At each level there is the specification itself, the objectives which a student is expected to attain and some suggestions as to how these objectives might be met.

The target for the following specification is grades 7 and 8 - introductory, grades 9 and 10 - intermediate, grades 11 and 12 - advanced.

### Levels

Grade	Age	Level
7	12 - 13	Introductory
8	13 - 14	
9	14 - 15	Intermediate
10	15 - 16	
11	16 - 17	Advanced
12	17 - 18	

The success of the specification can be measured in many ways such as the the students taking and passing a universal standard examination such as the European Computer Driving Licence and the International Computer Driving Licence.



In the suggestions for the way the subject is to be taught there are references to using ICT in subjects other than ICT itself, such as Geography and Mathematics. It is important that ICT should not be seen as a subject on its own but one which can be used as a tool within many subject areas.

No specific software titles or hardware manufacturers have been mentioned throughout the specification. Any type of software and computer can be used as long as the requirements of the specification can be met.

The grades and ages given above are a guide only. There is no age or time restriction on students who follow this specification.

Section C in the advanced level (Problem solving using IT) is designed for the student to solve and document a problem in ICT.

The specification has many areas where the student can gain practical knowledge of the computer. However some institutions may be lacking in hardware and may have to cover some of these topics theoretically.

The specification assumes three hours per week at each level with approximately 90 hours over a one-year period. Two hours can be used for learning the subject and the third hour can be used for applications that students can do in different subject areas such as languages, art, history, geography or mathematics utilising the different skills as they are acquired. Obviously this will depend on the human and physical resources available within the institution.



## 2 The Overall Specification

Unit	Introductory Level (1)	Intermediate Level (2)	Advanced Level (3)
A	What is a computer?	Computer systems	Programming
B	Basic input and output devices	Input and output devices	Data
C	Basic storage of data and managing files	Storage devices and media	Problem solving using IT
D	Introduction to email and the World Wide Web	Communications	Word processing, desktop publishing and other presentation software
E	Organising data	Data	Spreadsheets, modelling software and data handling
F	Nature of information and IT in society	Legal issues, implications, health and safety	Networks
G	Word processing	Word processing, desktop publishing and other presentation software	
H	Handling images and sound	Graphics	
I	Data handling	Spreadsheets, modelling software and data handling	
J	Logo	Programming, control and data logging software	
K	IT applications in everyday life	Information systems and applications	
L	Independent learning and managing your own computer		

### Infrastructure

The institution will need a suite of computers for the students which could be arranged as a network but need not be. Access to the computers at any time is advisable so that students can continue with their work out of lesson time. In order for the students to do work on the Internet and to send email they will need computers which have this facility. In order to do any of the control or data logging work there will need to be equipment available either for the students to use or for demonstration.



## Software Requirements

In order to follow this specification students will need to have access to

- Σ word processing software
- Σ desktop publishing software
- Σ presentation software
- Σ spreadsheet software
- Σ data-handling software
- Σ control software and hardware
- Σ data logging software and hardware
- Σ graphics software
- Σ communication software

## Teacher Skills

Teachers of specific units at the three levels will need to be proficient in the specific subject area they are teaching. They will need a good knowledge of the software that is being used for a specific unit.



### 3 Distribution Tables for Periods per week

#### Introductory Syllabus Time Scale

Unit Number	Unit Name	Suggested Number of Periods	Page Number
A	What is a computer?	3	9
B	Basic input and output devices	3	10
C	Basic storage of data and managing files	3	11
D	Introduction to email and the World Wide Web	12	12
E	Organising data	3	13
F	Nature of information and IT in society	12	14
G	Word processing	12	15
H	Handling images and sound	6	16
I	Data handling	18	17
J	Logo	6	19
K	IT applications in everyday life	6	20
L	Independent learning and managing your own computer	6	21
<b>Total</b>		<b>90</b>	



## Intermediate Syllabus Time Scale

Unit Number	Unit Name	Suggested Number of Periods	Page Number
A	Computer systems	9	22
B	Input and output devices	6	24
C	Storage devices and media	6	25
D	Communications	12	26
E	Data	3	27
F	Legal issues, implications, health and safety	12	28
G	Word processing, desktop publishing and other presentation software	15	30
H	Graphics	3	32
I	Spreadsheets, modelling software and data handling	6	33
J	Programming, control and data logging software	6	34
K	Information systems and applications	12	35
<b>Total</b>		<b>90</b>	





### Advanced Syllabus Time Scale

Unit Number	Unit Name	Suggested Number of Periods	Page Number
A	Programming	21	37
B	Data	18	39
C	Problem solving using IT	21	41
D	Word processing, desktop publishing and other presentation software	9	43
E	Spreadsheets, modelling software and data handling	9	44
F	Networks	12	45
<b>Total</b>		<b>90</b>	



## 4 Computer-related Curricula

### Introductory Level (1)

#### Unit A - What is a computer?

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.A.1	Recognise and use different types of hardware	The different types of common hardware.	Identify the different type of hardware that the student uses.
1.A.2	Recognise and use different types of software	The different types of common software. The difference between hardware and software.	Identify the different type of software that the student uses.
1.A.3	Know the main features of laptops, palmtops and other portable computers	The main components of a general-purpose computer including the Central Processing Unit, Internal Memory, Secondary/Backing Storage.	Identify the different parts of the computer.
1.A.4	Know the main features of desktop computers	The difference between portable (including laptops and palmtops) and desktop computers.	Identify the main differences between different type of computers. Show the students a portable, a laptop and a palmtop.



## Unit B - Basic input and output devices

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.B.1	Demonstrate proper care and protection of computer storage media including floppy disks and CD-ROMs	Floppy disks, CD-ROMs, magnetic stripes.	Show students the effect of magnets, the telephone and sticky drinks on a floppy disk. Demonstrate methods of moving the media from place to place.
1.B.2	Describe and use different input devices	Keyboards, mouse, touch pad, tracker ball, remote control, joystick, magnetic stripe, scanner, digital camera, microphone sensor, bar-code reader, touch screen, graphics tablet and voice input.	Show students the range of input devices. If possible let the students use them.
1.B.3	Describe and use different output devices	Monitor, printers (laser, ink jet and dot matrix) and speakers.	Show students the range of output devices. If possible let the students use them.
1.B.4	Demonstrate how to format and label a floppy disk	Recycled floppy disks and labels.	Allow students to format old disks and new unformatted disks and describe systematic labelling methods.



### Unit C - Basic storage of data and managing files

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.C.1	Describe different backing/secondary storage devices and media, their different types and uses	Common backing storage devices and media such as CD-ROMs, floppy disks and hard disks. Identify the different types and typical uses of different storage media.	Show students the range of storage devices. If possible let the students use them. Identify which are often internal, external or either.
1.C.2	Create folders, move files, copy files and delete files	Methods of moving, copying and deleting files. Creating and organising folders on the local hard disk or network (if appropriate).	Give students some exercises in manipulating files from and to floppy disks, local hard disks and a network (if appropriate).



## Unit D - Introduction to email and the World Wide Web

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.D.1	Describe the uses of user ID's and passwords	The meaning of user ID's and passwords. The uses of user ID's and passwords.	Discuss the reasoning behind having user ID's and passwords.
1.D.2	Describe different forms of communication media	A variety of communication media (e.g. fax, email, bulletin boards, tele/video conferencing).	Show the students fax, email, bulletin boards and tele/video conferencing.
1.D.3	Describe and use electronic mail and Internet browsing	The basic features of an electronic mail package. Use electronic mail facilities, including attaching documents, forwarding mail, and replying to messages. Use basic features of an Internet browser.	Demonstrate how messages may be sent using email and all the main features of an email package. Students can search for data in many of their lessons.
1.D.4	Create an Internet home page and a minimum of three linked web pages based on content from another curriculum area	Basic software for the creation of web pages. Information from current Geography or History lessons.	Teacher demonstrates construction of a simple web page and how to provide links for the user. Students work individually or in small groups to produce a set of linked web pages.
1.D.5	Produce a class web site as a group project	Design a class web site. Basic software for the creation of web pages.	Teacher leads brainstorming session on whiteboard to determine scope and content of web site. Teacher allocates tasks to pairs of students.
1.D.6	Correspond with teachers and other students by email	Students send and receive email.	Teacher demonstrates basic features of sending/receiving emails and attachments. Students send emails (and digital images of themselves) to the teacher. Class group establishes contact with another similar class either nationally or internationally and exchanges emails.
1.D.7	Distinguish between appropriate and inappropriate uses of email	Describe inappropriate use of email.	Teacher illustrates 'junk' mail, spamming and problems of receiving very large files containing images.



### Unit E - Organising data

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.E.1	Select the best format to present information and explain why they chose the format	Text, tables, graphs, charts, pictures, and diagrams.	Teacher has various bits of information and discusses with students how best to present it. NB need not be all on a computer screen.
1.E.2	Exchange data between spreadsheet, database and word processing documents	Files of data e.g. class names etc. Spreadsheet, data handling and word processing software.	Teacher demonstrates how to move files to and from the tools packages. Students practice with a small file created by the teacher.



## Unit F - Nature of information and IT in society

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.F.1	Describe the need for software copyright	The meaning of software copyright.	Discuss why software needs to have a copyright law.
1.F.2	Explain how national and international copyright laws affect computer and Internet users	The national and international laws on copyright. Intellectual property and moral issues	Discuss rights and wrongs of indiscriminate copying and software piracy
1.F.3	Describe computer hacking	The meaning of hacking and where and why it is used. Measures that must be taken in order to protect against hacking.	Show how a system can protect itself against hacking.
1.F.4	Describe computer viruses	The nature of a computer virus. Measures that must be taken in order to protect against viruses.	Discuss what computer viruses can do to a computer system and show the students how the computers they use have been protected against viruses.
1.F.5	Describe how computers affect the health of individuals	The potential health problems related to the prolonged use of ICT equipment and some simple strategies for preventing these problems.	Describe potential health problems within the computer room.
1.F.6	Describe how an individual is kept safe when using a computer	A range of safety issues related to using computers (electrical, heat, light related) and measures for preventing accidents.	Discuss how an attempt is made to keep the students safe when using a computer.
1.F.7	Explain the concept of bias in evaluating information from the Internet and other sources	Selected web sites covering a news item or cure for a disease from different sources.	Teacher highlights differences in facts, emphases, depth of information etc. between 2 or more sources. Students work in pairs to carry out analysis on similar sources.



## Unit G - Word processing

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.G.1	Describe the features of a word processor	The common features found in word processors.	The word processor used by the students can be used to demonstrate the main features.
1.G.2	Describe the basic tasks and uses of word processors	The basic tasks that can be carried out by word processors.	Give example of the use of word processors. Students can create documents in all of their lessons.
1.G.3	Import images into a word processing document	Clip art, image files, Internet web pages containing images	After demonstration, students write an illustrated piece of text about an animal, bird or plant.
1.G.4	Create columns, embedded graphics and newspaper formats	Word processing software.	Teacher demonstrates more advanced features of the word processor and asks students to take a piece of pre-written text and format it into columns, add graphics and titles etc.





## Unit H - Handling images and sound

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.H.1	Describe the basic tasks and uses of graphics packages	Use the basic features of a graphics package to create or modify an image.	Take an image and let the students modify it. Students can manipulate images in many areas of Art and Design.
1.H.2	Find, format and import various types and sizes of maps into word processing documents or multimedia presentations	Introduce maps from a variety of web sites.	Students write about a region or country, illustrating with appropriately sized maps. This activity could take place in Geography or History lessons.
1.H.3	Produce a multimedia presentation to include self generated sounds, narration and graphics	Multimedia presentation software and digital sound recorder.	Students work in groups to produce various elements of the multimedia presentation which may focus on a poem (Arabic language), an historic event (History), a recipe (Food Technology), a Scientific Discovery (Science) etc.



## Unit I - Data handling

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.1.1	Describe the basic features of spreadsheets	Describe the basic features of spreadsheet software. Include using several spreadsheets, using the help facility, changing the view of the spreadsheet, entering numbers, text and formulas, moving data between cells, searching and replacing data in cells, inserting rows and columns, sorting data, using absolute and relative cell references and replication, using functions, formatting cells, formatting borders and printing.	Show the basic features of the spreadsheet which the student's use. Students can use formula in Mathematics lessons.
1.1.2	Describe the basic features of data-handling packages	Describe the basic features of database software. Include using several databases, using the help facility, changing the view of the database, entering numbers and text, moving data within the database, searching and replacing data in the database, inserting records and fields, sorting data, searching using simple and complex searches, formatting data, formatting borders and printing.	Show the basic features of the data-handling package that is used by the students.
1.1.3	Create and enter data	Create a database and spreadsheet.	Show how data is entered into a spreadsheet and a database.
1.1.4	Format data	Make data have a variety of styles.	Show the different styles of an entry in a



	Sort and search data	Sort and search the data.	spreadsheet and a database.
<b>1.1.6</b>			Show how the entries in a spreadsheet and a database can be sorted and searched. Students can search for data in History lessons.
<b>1.1.7</b>	Enter numerical data into a spreadsheet and create a variety of graphs and tables	Create numerical data from an expression (e.g. $x^2 - 5x + 6$ )	Students illustrate the data using line graphs, histograms, bar charts etc. and discuss merits of display methods and which are most useful in terms of mathematical interpretation.
<b>1.1.8</b>	Create scattergrams and correlation graphs using an appropriate statistical package	Using real data to establish the relationship between two variables and its significance.	Two sets of data (e.g. heights and weights of class members) can be used by students to produce scattergrams and lines of best fit.
<b>1.1.9</b>	Create a database of information from an opinion survey, create charts and graphs from the survey and explain their significance	Collect data and create a database in an appropriate package.	Design a short questionnaire on a topical issue; gather information from their own class or another. Test a hypothesis against the data collected and write up an illustrated report.
<b>1.1.10</b>	Formulate an original hypotheses on a given topic and use a data-handling package and the Internet to test and support/reject their hypothesis	Formulating hypotheses, testing them against various sources of information e.g. databases, Internet, encyclopaedias and reference books	Teacher suggests ideas e.g. life expectation is longer in North Africa than Southern Africa, desert areas are expanding at the same rate as rain forests are decreasing. Students work in groups to determine the credibility of given hypothesis.



## Unit J - Logo

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.J.1	Write simple procedures with at least one variable	Writing and testing procedures to produce a variety of shapes.	Teacher demonstrates control of turtle and introduces concept of a procedure and the handling of variables. Students create regular/irregular shapes including polygons, circles and capital letters of Roman alphabet (Mathematics, symmetry).
1.J.2	Introduce a random variable and be able to control repetitive procedures	Writing procedures to model spirals, expanding squares etc. to a given limit. Use of the random variable function to sample from the natural numbers and use in procedures.	Teacher challenges students to produce a variety of shapes and patterns. These can be exported to an image processing package, coloured and printed (Art & Design). Students can produce a random sequence of events and count occurrences e.g. tossing a coin or throwing a die (Mathematics).



### Unit K - IT applications in everyday life

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.K.1	Describe at least three different kinds of IT application that they experience on a daily basis	IT applications: automatic door opening, domestic appliances, traffic lights, supermarket checkout etc.	Teacher explains nature of control, feedback and the microprocessor chip. Students write up about one application of their choice, researching the role of IT in the working of the device.
1.K.2	Describe the consequences of an IT application failure and the impact on every day life	The reliance of humans on technology in everyday life. Comparison between rich and poor nations.	Teacher discusses issues such as people in hot countries relying on air conditioning, use of the telephone, email, electronic banking and instant access to information. Environmental issues may be raised here such as renewable energy resources, land use etc. (Environmental Science).



## Unit L - Independent learning and managing your own computer

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
1.L.1	Use the Internet for their own research purposes and cite sources obtained from the Internet	Access to the Internet in student's own time.	Student's self-paced study.
1.L.2	Produce a research paper with proper footnotes, bibliography, table of contents and pagination	Access to the Internet in student's own time. Access to a computer in student's own time.	Response to teacher's requirements.
1.L.3	Explain the concept of plagiarism in regard to the Internet	Understanding of writing styles, précis, re-working documents and concept of intellectual property rights.	Teacher responds to work handed in (on paper or electronically) by questioning students individually.



## Intermediate Level (2)

### Unit A - Computer systems

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
2.A.1	Use simple binary arithmetic	Binary patterns. Addition and subtraction of binary numbers.	Practice addition and subtraction of binary numbers.
2.A.2	Know the differences between microprocessor devices and mainframes	The differences between microprocessor technology and mainframe technology.	Talk about the differences between microprocessor devices and mainframes. Visit an installation that uses mainframes.
2.A.3	Know the difference between intelligent and dumb terminals	The differences between intelligent and dumb terminals.	Show the students both intelligent and dumb terminals.
2.A.4	Describe the applications of microprocessor devices and mainframes	A range of applications where either microprocessor technology is used or where mainframe technology is used.	Talk about applications where microprocessors are used eg washing machines, video tape players, central heating systems etc.
2.A.5	Describe different types of software	Different types of software. Operating systems, user interfaces, utilities, applications software, programming languages.	Show the students the different types of software that are used with a computer.
2.A.6	Describe how the memory of a computer operates	The difference between RAM and ROM, and a description of their uses.	Discuss the differences between RAM and ROM.
2.A.7	Describe graphical user interfaces (GUI) and command line interfaces	The main features of a graphical user interface. The difference between a GUI and a command line interface, explaining their relative benefits and drawbacks.	Show the students both type of input.



<p><b>2.A.8</b></p>	<p>Describe how to use the computer and to manage files</p>	<p>Describe and use the main features of the computer such as windows icons, menus and pointers; how the computer is configured, deletion of files; setting up a disk for use (including formatting), use of help functions; creation of directories and subdirectories; re-naming of files; copy and paste files within directories; make backup copies; locate a file using suitable tools; copying files between media; selecting and printing a document.</p>	<p>The features of the computer system used by the students can be used as the main example,</p>
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## Unit B - Input and output devices

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
2.B.1	Describe and use different input devices	Video digitiser, midi instrument, sound sampler, OMR, OCR and MICR. Show suitable uses of different input devices, giving the advantages and disadvantages of every one.	Show students the range of input devices. If possible let the students use them.
2.B.2	Describe and use different output devices	Plotter and control devices (including lights, buzzers, robotic arms, motors).	Show students the range of output devices. If possible let the students use them.
2.B.3	Describe the advantages and disadvantages of input/output devices	The suitable uses of different output devices, stating the advantages and disadvantages of each. Identify purchase costs, running costs, permanence, quality and speed of different output devices.	Where and when the devices are used. Make a table of costs/permanence/quality and speed.
2.B.4	Describe the practical uses of data collection	Relate the range of data collection methods to specific uses.	Relate the input/output devices to where they are used in practice.



## Unit C - Storage devices and media

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
2.C.1	Describe different backing/secondary storage devices and media, their different types and uses	CD-R, CD-RW, Zip drives and different drives built into a computer. Identify the different types and typical uses of different storage media.	Show students the range of storage devices. If possible let the students use them. Identify which are often internal, external or either.
2.C.2	Describe the advantages and disadvantages of different types of backing storage media	The advantages and disadvantages of using different backing storage media for example speed of access and storage capacity.	Where and when the devices are used. Make a table of speed of access and storage capacity.
2.C.3	State the importance of using backups	Define backup and describe the need for taking backups.	Why use backups. Relate to the student's own experience of losing data through not making backups.
2.C.4	Know the difference between internal memory and backing storage	Define the difference between internal memory and backing storage, stating the benefits of each in terms of speed and permanence.	Make a table that shows both the advantages and disadvantages of different types of backing store.
2.C.5	Describe where data storage devices are used	Relate the range of data storage methods to specific uses.	Relate the storage devices to where they are used in practice.



## Unit D - Communications

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
2.D.1	Describe modems and dedicated lines	The features of a modem and the fact that it is used with analogue telephone lines. State what a dedicated line is and why it is not necessary to use a modem when using dedicated lines.	Discuss with the students the features of a modem and a dedicated line.
2.D.2	Describe telecommunications and its relationship to computer to computer communication	The relationship between telecommunications and communication between computers explaining the need for communication links when data is to be transferred between one computer and another.	Use the Internet to demonstrate computer to computer communication.
2.D.3	Describe the conversion of analogue and digital data and the different ways the data is represented	The differences between analogue data and digital data. The need for conversion between analogue and digital data.	Show the students where it is necessary to convert from analogue to digital data eg temperature measurement.
2.D.4	Describe the advantages and disadvantages of using computer networks	The advantages and disadvantages of using a computer network.	Discuss the advantages and disadvantages of using a computer network.
2.D.5	Describe and use electronic mail and Internet browsing	Use electronic mail facilities including adding a mail address to a list of addresses. Identify and use advanced features of an Internet browser.	Demonstrate how messages may be sent using email and all the main features of an email package. Students can search for data in many of their lessons.
2.D.6	Describe the various ways the public telephone system is used with computers	Understand the terms Public Switched Data Network (PDSN), Integrated Service Digital Network (ISDN) and satellite communications.	Discuss how these three systems can be used.



<b>2.D.7</b>	Use the Internet to participate in live events, such as a world event webcast	Understand the concept of 'webcasting', the nature of real-time use of the Internet and participation in an event.	Teacher locates appropriate opportunity to engage in a webcasting event. This would be a whole class exercise and may require preparation of relevant questions.
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### Unit E - Data

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
<b>2.E.1</b>	Use different forms of data such as Boolean, text, numeric, and date	Identify different data types such as Boolean, text, numeric and date. Select appropriate data types for a given set of data.	Show where each of the types of data can be used.
<b>2.E.2</b>	Know how a file, record and field relate to one another	Describe the terms file, records and fields.	Draw diagrams and use a simple database to illustrate where these features can be used.



## Unit F - Legal issues, implications, health and safety

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
2.F.1	Describe the social effects of ICT related to human use	Describe the changing patterns of employment including areas of work where there is increased unemployment. Describe the effects of microprocessor-controlled devices in the home including effects on leisure time, social interaction and the need to leave the home.	Discuss how work has changes due to the introduction of computers. Students may never have known a time when computers were not around so they will need to imagine a world without computers.
2.F.2	Describe the social effects of ICT related to computer data	The use of photo editing software to change reality. The effects of variation in computer access and ICT skills between different people. The capabilities and limitations of ICT and how communications systems have changed our use of ICT. The issues of information found on the Internet related to unreliability, undesirability and the security of data transfer.	Use the computer to create a fake head on a body to give the wrong impression. Discuss the different levels of access people have to computer systems. Discuss the changes the use of communications has made to our use of ICT.
2.F.3	Describe how data is kept safe from others	The main aspects of a country's rules on data protection.	Discuss how the country's data protection system operates.
2.F.4	Describe how computers can be misused	The main aspects of a country's rules on computer misuse.	Discuss how the country's rule on computer misuse operates.
2.F.5	Know the different methods used to prevent unauthorised access to computers	A range of methods for preventing unauthorised access to computer systems.	Show the students how difficult it is to get into a system that is protected.
2.F.6	Know the different methods used to prevent electronic fraud	What is meant by data encryption and identify when it is used.	Let the students create a simple encryption method and apply it to a short paragraph.



<b>2.F.7</b>	Describe the changing pattern of commerce and industry due to the increased use of IT	The changes to the way businesses work due to the introduction of IT. Discuss the changes in general in industry.	Discuss how the operation of a company changes when computers are introduced.
<b>2.F.8</b>	Describe the changing pattern of employment due to the increased use of ICT.	Discuss the changes in employment due to the introduction of computers and increasing use of network technology such as teleworking, flexible hours, job satisfaction, ease of tasks, training, re-training, work monitoring.	Discuss how employees have been affected by the introduction of ICT.



## Unit G - Word processing, desktop publishing and other presentation software

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
2.G.1	Describe the features of a desktop publisher and other presentation software	The common features found in desktop publishers and other presentation software.	The desktop publishing packages used by the students can be used to demonstrate the main features.
2.G.2	State the differences between a word processor and a desktop publisher	The differences between a word processor and a desktop publisher.	The differences can be highlighted by example documents to bring out their different uses.
2.G.3	Describe the basic tasks and uses of desktop publishers	The basic tasks that can be carried out by desktop publishers.	Give examples of the use of desktop publishers. Students can create documents in many of their lessons.
2.G.4	Use basic features of a variety of different types of software used for presenting information in textual, graphical or multimedia format	Use basic features of word processors, desktop publishers and other presentation software in order to create documents.	Use a presentation package as an example of how software can be used to share information.
2.G.5	Create a presentation which is viewed by others	Use the basic features of the presentation software. Include using the help facility, changing the view of the presentation, entering numbers and text, moving data between positions, searching and replacing text, formatting text, formatting borders, importing pictures, sounds and movies, formatting text and numbers, create animation effects, use a spelling checker, create a slide show and printing.	Use a presentation package to create a presentation on a topic of interest to the student. Students can produce presentations in a variety of lessons.
2.G.6	Contribute to the creation of a class magazine which is both topical and	Create a class magazine which is both topical and informative	Students, individually create a multi-page newspaper, using



	informative		borders, clip art, headlines, text boxes, pictures and a variety of text styles
<b>2.G.7</b>	Describe multimedia systems and their uses	Use voice output, sound, video and animation. The nature of their use in multimedia systems, identifying typical applications where there is a clear advantage.	Use multimedia in presentation software. In many subjects students can be taught how to collect, record and present evidence.
<b>2.G.8</b>	Create a multimedia presentation designed to sell an idea or product to a wider audience	Use of all forms of digital presentation and the concepts of integration, convergence and projection.	Each group chooses a product or an idea ('come and visit Amman' or 'a widget for squeezing lemons' etc.) and produces their presentation for rest of class.





## Unit H - Graphics

Number	Objectives	Content	Methods, Means and Activities
2.H.1	Students should be able to: Describe the common features of graphics manipulation software	The common features of basic graphics packages. Identify basic tasks that can be carried out using graphics manipulation packages.	Let the students use graphics manipulation software to produce a specified diagram.



## Unit I - Spreadsheets, modelling software and data handling

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
2.1.1	Write rules and formulas	Use spreadsheet software OR modelling software OR data handling to carry out a simple suitable task which will allow modification of rules and testing hypotheses. Describe how a data model may be used for answering 'what-if' questions and explain the benefit of being able to answer such questions using a data model.	Use the student's spreadsheet software to help create suitable models. Students can be taught decision-making skills eg by using a spreadsheet find the best location for a superstore.
2.1.2	Create graphs and charts	Create graphs and chart using a data-handling package or a spreadsheet.	Show how the entries in a spreadsheet and a data-handling package can be used to produce charts.
2.1.3	Describe the difference between a spreadsheet and a data-handling package	Identify the differences between a spreadsheet and a data-handling package giving the advantages and disadvantages of each.	Talk about the relative benefits of a spreadsheet and a data-handling package.
2.1.4	Describe typical tasks for spreadsheets and data-handling packages	Identify applications that use data-handling packages and spreadsheets.	Talk about the applications that use spreadsheets and data-handling packages.
2.1.5	Use a spreadsheet for a typical modelling task	Identify typical tasks which spreadsheet and other modelling software can be used for.	Talk about the applications that model using spreadsheets.
2.1.6	Use a database for a typical data-handling task	Identify typical tasks which data-handling packages can be used for.	Talk about the applications that use data-handling packages.



## Unit J - Programming, control and data logging software

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
2.J.1	Describe different forms of data logging	Different types of sensor and suitable uses. The advantages and disadvantages of computerised data logging rather than logging data manually.	Show the students different types of sensors. Discuss why it is easier to use a computer.
2.J.2	Transfer data from data logging devices to computer software	The transfer of collected data to a spreadsheet or a database.	Show how data is transferred to another application.
2.J.3	Know different program instructions	Instructions to respond to data from sensors. A sequence of instructions to control a screen image or external device such as lights, buzzers, sound or turtle, using repeated instructions, procedures and variables as appropriate.	Write a program that controls an object or reacts to sensors. Students can use heart-monitoring devices in Physical Education.
2.J.4	Describe how to control different devices	Typical applications involving the use of control software or data logging.	Discuss applications that use control and data logging software. Students can use many applications of data logging in Science.



## Unit K - Information systems and applications

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
2.K.1	Describe the difference between backup and archiving data	The difference between data which is backed up and data which is archived.	Discuss the differences between backup and archiving data.
2.K.2	Describe verification and validation methods	Verification methods such as double entry and visual checks. A range of validation checks and their suitability in certain circumstances.	Describe different forms of verification and validation. Use your database to show different ways data can be validated.
2.K.3	Describe batch processing, on-line and real-time processing	Uses of batch processing, on-line processing and real-time processing identifying the circumstances when it is necessary to adopt each different method of processing.	Discuss the circumstances when the three systems are necessary.
2.K.4	Describe the control-feedback loop	The main components of the control-feedback loop of a closed system including input, process, output, feedback, giving a typical application using physical variables.	Use a common application to describe the feedback loop.
2.K.5	Describe information systems investigation methods	Identify a range of systems investigation methods including questionnaires, interviews and observations, suggesting situations when each might be suitable. Discuss the advantages and disadvantages of different systems investigation methods.	Create questionnaires and data capture forms. Try them out on other classes and discuss the results.
2.K.6	Design a suitable form	The main issues governing design of suitable data capture forms.	Students should design a form to enter data.
2.K.7	Design a suitable file	The main issues governing the design of files including data types, selection of fields and coding of data.	Students should design a data file to store data.
2.K.8	Design suitable output	The main issues governing the design of	Students should design a data



		screens and reports.	file to store data.
<b>2.K.9</b>	Describe different system implementation strategies	Different systems implementation strategies such as direct, phased, pilot or parallel running.	Discuss the different ways of implementing systems.



## Advanced Level (3)

### Unit A - Programming

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
3.A.1	Describe the different types of programming software available	Describe the actions of an assembler, an interpreter and a compiler.	Use simple examples to demonstrate how each type of programming software operates.
3.A.2	Solve problems	Describe various problem-solving techniques solving problems in a structured way using logic and reason. Use algorithmic techniques.	Create different algorithms using flowcharts and pseudo code.
3.A.3	Describe the features of programming languages	Explain the use of different programming constructs.	Demonstrate how a sequence, selection and repetition are used. Take examples from the programming language that the students will use.
3.A.4	Describe and use procedures and functions	Define both procedures and functions. Identify different ways of passing parameters.	Use your programming language to show different ways of passing parameters to procedures and functions.
3.A.5	Describe and use recursion	Define both tail end and in-code recursion. Show how parameters can be passed.	Use your programming language to show different ways of using recursion.
3.A.6	Describe source and object code	Describe how translators change source code into object code.	Show how a simple piece of source code can be translated into object code.
3.A.7	The different types of errors which could occur in both source and object code	Describe the different types of error that can occur - syntax, logical and arithmetic.	Give examples of how the different type of error can occur.
3.A.8	Test software/programs	Describe different test strategies used in programming. Describe and use the tools and	Show white box testing, black box testing, alpha and beta testing. The teacher should demonstrate the use



		methods available for identifying programming errors.	of translator diagnostics, debugging tools, desk checking, bottom-up programming and test strategies using the programming language available to the students.
<b>3.A.9</b>	Maintain programs	Describe how good program design will help the ongoing maintenance of programs.	Students should be shown how to use comments, meaningful data names, indentation and modularity.



## Unit B - Data

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
<b>3.B.1</b>	Describe different numbering systems	Express numbers in octal, hexadecimal, binary and Binary Coded Decimal (BCD). Perform addition and subtraction using these numbering systems. Show how two's complement and sign and magnitude can be used to represent positive and negative binary numbers.	Show how numbers can be represented in different forms for computer use. Show how addition and subtraction are performed on these numbering systems. Show how both sign and magnitude and two's complement can be used to represent positive and negative binary numbers.
<b>3.B.2</b>	Describe different data types	Express character sets using codes. Describe different data types such as numeric (integer and floating point), Boolean and character.	Show how codes can be used to represent character sets. Show how numbers and characters can be represented using numeric (integer and floating point), Boolean and character.
<b>3.B.3</b>	Describe data structures	Define and use arrays for solving simple problems. Define and use linked lists for solving simple problems.	Students should be shown how to use both single and multi-dimensional arrays to solve problems. They should know how to initialise arrays, how to read data into arrays and perform a serial search on an array. Students should be shown how to use linked lists to solve problems. They should know how to initialise linked lists, how to read data into linked lists and perform a serial search on a linked list.
<b>3.B.4</b>	Describe stacks and queues	Describe the features of a stack	Demonstrate how stacks and queues





		and a queue showing the different ways in which they operate.	operate.
<b>3.B.5</b>	Describe fixed and variable length format	Explain why data is held as fixed length and variable length formats.	Demonstrate how data can be held as either fixed or variable length using a software package.
<b>3.B.6</b>	Design a record format	Design a record format using fixed and variable length records.	Using the database created by the students, design a database format.
<b>3.B.7</b>	Estimate the size of a file	Give an idea of the size of a file knowing the number of records and the size of each field.	Take various structures and estimate the size of the file.
<b>3.B.8</b>	Know the difference between different methods of accessing data in a file	Describe the differences between serial, sequential, indexed sequential and random access to data.	Discuss the different methods of accessing data.



### Unit C - Problem solving using ICT

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
3.C.1	Analyse a problem	Students identify methods by which to investigate a problem including questionnaires, data capture forms, observation and structured interviews. Analyse the data and tasks carried out, identifying problems with the current methods and procedures. Document the system requirements for later use during evaluation.	Students develop a method of solving the problem. They devise methods by which to investigate the problem: including questionnaires, observation and structured interviews. They look at how the problem is currently solved.
3.C.2	Design an ICT solution to a problem	Specify the required hardware and software. Design data capture forms and screen layouts. Design report layouts, screen displays and other forms of output (e.g. audio output). Specify any verification and validation required and feedback required if any data is input in error. Design the required data/file structures necessary from the requirements specification.	Students produce the specification of the data structure, designing forms, inputs, outputs, verification, validation and diagrams.
3.C.3	Develop the solution to a problem	Develop the data structures of the design using appropriate features of the software package. Develop the input/outputs and validation checks for their user using the features of the chosen package. Identify, develop and document a test	Students develop an ICT solution to the problem. They develop the inputs/outputs necessary. They create a suitable test strategy.



		strategy for the design, ensuring that normal, abnormal and extreme circumstances are tested.	
<b>3.C.4</b>	Test the solution to a problem	Test the new system, illustrating how improvements are carried out as a result of testing.	Students test the system using their test strategy.
<b>3.C.5</b>	Implement the solution to a problem	Devise a strategy for system implementation.	Students put the system in a working environment.
<b>3.C.6</b>	Document a system	Describe the purpose of the system and its limitations to the user. Describe the hardware and software required to run the system. Describe how to use the system, illustrating the system in use. Describe the inputs, validation and any outputs from the system. Produce a section on troubleshooting errors for the user.	Students produce a document that describes how to use a system.
<b>3.C.7</b>	Evaluate the solution	Evaluate the final system against the criteria described in the requirements specification. Evaluate the users' responses to testing the system. Identify the good and bad points of the final system highlighting any limitations and necessary extensions to the system, indicating how the extensions could be carried out.	Students need to compare the solution with the original design specification.



### Unit D - Word processing, desktop publishing and other presentation software

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
3.D.1	Create standard tables	Creation of tables using the features of the software. Students should insert and delete columns and be able to use any automatic formatting that is available.	Use the software available to the students to make the tables.
3.D.2	Change graphics within a document	Using any features of the word processor or desktop publisher, edit the charts or pictures which are on display.	Use the software available to the students to alter the charts or pictures.
3.D.3	Import an object into a document	Using any features of the word processor or desktop publisher, import objects from another application.	Using any features of the word processor or desktop publisher, import a spreadsheet application and a chart from a spreadsheet.
3.D.4	Mail merge to produce multiple documents	Create a table of data and mail merge this into a document.	Create a sheet of address labels and create a number of the same documents with suitable data in each from the table.



## Unit E - Spreadsheets, modelling software and data handling

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
3.E.1	Import objects into their spreadsheet	Import objects into the spreadsheet such as images, files, graphs and text files. Change the size of the imported objects.	Use the software available to the students to perform the importing.
3.E.2	Create graphs and charts	Create different types of graphs and charts from the spreadsheet to analyse the data eg pie charts, bar charts, scatter graphs.	Use the software available to the students to perform data analysis and produce the graphs. Students can produce charts in Mathematics lessons.
3.E.3	Modify charts and graphs	Modify a chart or graph to add a title, change the scale, change the colour, add comments etc.	Use the software available to the students to change the graphs.
3.E.4	Create reports using data-handling software	Present selected data in a particular sequence on the screen and in a report. Change the content of a report. Create headers and footers in a report. Group the data together so that a student can produce report totals and subtotals.	Use the software available to the students to make reports and modify them.



## Unit F - Networks

Number	Objectives	Content	Methods, Means and Activities
	Students should be able to:		
3.F.1	Describe the different methods of communication	Different methods of communication.	Discuss the different ways in which data can be communicated.
3.F.2	Describe different network topologies	Different network topologies - identifying briefly the relative advantages of each.	If the centre has a network use it to demonstrate the topology. Discuss the other topologies.
3.F.3	Describe the difference between LANs and WANs	The terms Local Area Network (LAN) and Wide Area Network (WAN). The difference between LANs and WANs and their main characteristics.	Use the local network and the Internet to show the difference between LANs and WANs.
3.F.4	Describe common network environments	The characteristics and purpose of common network environments, such as intranets and the Internet. Discuss the problems of confidentiality of data, including problems surrounding common network environments. Identify the need for encryption and authentication techniques when using common network environments like the Internet.	Discuss the differences between an intranet and an internet. Use the centre's system to demonstrate the difference. Show why encryption is necessary using banks as an example.



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