

Full course ICT GCSE – syllabus content

Paper 1

5.1 COMPUTER SYSTEMS, COMMUNICATIONS TECHNOLOGY AND INFORMATION MANAGEMENT

Study a range of applications found in the home, at school and general everyday life, in order to fully understand some of the basic concepts of ICT.

Examples of Applications for the Short Course

Newsletters, publicity and corporate image such as business card/letterhead/flyer/brochure

Room layouts, websites, multimedia presentations; Music scores; cartoons;

Surveys, address lists, tuck shop records, clubs and society records

Range of CD-ROM material including computer based training/Computer Assisted Learning

Personal finance; School reports; School library; Scientific experiments, electronic timing, environmental monitoring

Turtle graphics, control of lights, buzzers and motors

Automatic washing machines, automatic cookers, toys, central heating controllers, burglar alarms, video

recorders/players, microwave ovens, digital watches

Costing of materials, 3D modelling, simulation e.g. flight or driving

Content

- Computer systems: components and types of system
- Input and output devices
- Storage devices and media
- Introductory communications
- Data: types and terminology
- Information management and effects of IT: legal issues, implications, health and safety

5.1.1 Computer Systems: Components and Types of System

(a) Hardware components of a computer system

(b) Software: definition and examples

(c) Laptops/notebooks, palmtops and other portable systems

(d) Desk-top computers

Learning Outcomes Candidates should be able to:

(i) define hardware, giving examples;

(ii) define software, giving examples;

(iii) describe the difference between hardware and software;

(iv) identify the main components of a general purpose computer: Central Processing Unit, Main/Internal Memory, Input Devices, Output Devices and Secondary/Backing Storage;

(v) describe the difference between portable (including laptops/notebooks and palmtops) and desktop computers.

5.1.2 Input and Output Devices

(a) Input devices: identification and use

(b) Output devices: identification and use

(c) Advantages and disadvantages of different types of input/output device

Learning Outcomes Candidates should be able to:

(i) identify the following input devices: keyboards, pointing devices (including mouse, touch pad and tracker ball), video digitisers, remote controls, joysticks, magnetic stripes, scanners, digital cameras, microphones, sensors, MIDI instruments;

(ii) identify suitable uses of the input devices in (i) above, stating the advantages and disadvantages of each;

(iii) identify the following output devices: monitors, printers (laser, ink jet and dot matrix), plotters, speakers, control devices (including lights, buzzers, robotic arms and motors);

(iv) identify suitable uses of the output devices in (iii) above, stating the advantages and disadvantages of each;

(v) identify relative purchase costs, running costs, quality and speed of different types of printers.

5.1.3 Storage Devices and Media

(a) Backing/Secondary storage devices and media: different types and uses

(b) Advantages and disadvantages of different types of backing storage media

(c) Importance of backups

(d) Difference between main/internal memory and backing storage

Learning Outcomes Candidates should be able to:

(i) describe common backing storage media (such as magnetic tape, CD-ROM, floppy disc and hard disc) and their associated devices;

(ii) identify typical uses of the storage media in (i) above;

(iii) describe the comparative advantages and disadvantages of using different backing storage media;

(iv) define the term backup and describe the need for taking backups;

(v) define the difference between main/internal memory and backing storage, stating the relative benefits of each in terms of speed and permanence.

5.1.4 Introductory Communications

- (a) Modems and digital telephone lines (b) Analogue to digital conversion and digital to analogue conversion
 (c) Advantages and disadvantages of using computer networks
 (d) User ids and passwords (e) Communication media

Learning Outcomes Candidates should be able to:

- (i) describe a modem, its purpose and how it is used with analogue telephone lines;
 (ii) state why it is not necessary to use a modem when using digital telephone lines;
 (iii) state the difference between analogue data and digital data;
 (iv) describe the need for conversion between analogue and digital data;
 (v) identify the advantages and disadvantages of using common network environments such as the Internet;
 (vi) describe what is meant by the terms user ids and passwords, stating their purpose and use;
 (vii) identify a variety of communication media such as fax, e-mail, bulletin boards, and tele/video conferencing.

5.1.5 Data: Types and Terminology

- (a) Types of data – alphanumeric/text, numeric (real and integer), date, logical/Boolean
 (b) Definition of file, record, field and key field

Learning Outcomes Candidates should be able to:

- (i) identify different data types: logical/Boolean, alphanumeric/text, numeric (real and integer) and date;
 (ii) select appropriate data types for a given set of data: logical/Boolean, alphanumeric/text, numeric and date;
 (iii) describe the terms: file, record, field, and key field.

5.1.6 Information Management & Effects of IT: Legal Issues, Implications, Health & Safety

- (a) Software copyright (b) Hacking (c) Viruses (d) Social effects of ICT (e) Health (f) Safety

Learning Outcomes

Candidates should be able to:

- (i) describe what is meant by software copyright;
 (ii) describe what is meant by hacking;
 (iii) describe what a computer virus is;
 (iv) explain the measures which must be taken in order to protect against hacking and viruses;
 (v) describe the changing patterns of employment including areas of work where there is increased unemployment;
 (vi) describe the effects of microprocessor-controlled devices in the home including effects on leisure time, social interaction and the need to leave the home;
 (vii) describe the use of photo editing software to distort reality;
 (viii) describe the effects of variation in computer access and ICT skills between different people;
 (ix) describe the capabilities and limitations of ICT and how communications systems have changed our use of ICT;
 (x) discuss the issues relating to information found on the Internet, for example unreliability, undesirability and security of data transfer;
 (xi) describe the potential health problems related to the prolonged use of ICT equipment, for example RSI, back problems, eye problems and some simple strategies for preventing these problems;
 (xii) describe a range of safety issues related to using computers (electrical, heat, light related) and measures for preventing accidents, particularly in the work place such as not overloading electrical sockets, no trailing wires, no food and drink around the computer, installing fire extinguishers etc.

5.2 PRACTICAL SKILLS & UNDERSTANDING RELATING TO THE USE OF ICT APPLICATIONS

Projects 1a and 1b will assess this module although some of the theoretical issues will be examined by Paper 1.

Content

- Word processing, desk-top publishing and other presentation software
 Graphics production and image manipulation Spreadsheets, modelling and databases
 Data logging and control software Systems tasks and software

5.2.1 Word Processing, Desk-top Publishing and Other Presentation Software

- (a) Common features of a word processor and desk-top publisher
 (b) Differences between a word processor and desk-top publisher
 (c) Basic tasks and uses of word processors and desk-top publishers
 (d) Use basic features of a variety of different types of software used for presenting information in textual, graphical or multimedia format

Learning Outcomes Candidates should be able to:

- (i) identify the common features found in word processors, desk-top publishers and other presentation software such as left/right/full justification, centring, indentation, boldening, italics, underlining, copy, cut and paste, bullets, numbering, font selection, point size, font highlight and colour, borders, page and line breaks, columns, tabs, tables, spelling and grammar, word count, inserting pictures and drawing or other objects, grouping, ungrouping, layering, sound effects, animation etc;
 (ii) identify basic tasks which can be carried out by word processors and desk-top publishers such as letter writing, memos, reports, flyers, brochures, posters, business cards, interactive presentations, web pages etc;
 (iii) use basic features of word processors, desktop publishers and other presentation software in order to create documents such as letters, posters, leaflets, essays, interactive (multimedia) presentations.

5.2.2 Graphics Production and Image Manipulation

(a) Common features of graphics manipulation software (b) Common features of scanning software

(c) Basic tasks and uses of graphics packages

Learning Outcomes Candidates should be able to:

- (i) identify common features of basic graphics packages, for example: fill, shade, layering, size, orientation, repeating pattern;
- (ii) identify basic tasks which can be carried out using graphics manipulation packages including changing the look of scanned, drawn or photographed images;
- (iii) identify the features of scanning software;
- (iv) use the basic features of a single graphics package to create or modify an image.

5.2.3 Spreadsheets, Modelling and Databases

(a) Collect/enter data

(b) Verification and validation

(c) Format data

(d) Write rules and formulas

(e) Sort and search data

(f) Create graphs and charts

(g) Features of spreadsheets and databases (h) Typical tasks for spreadsheets and databases

(i) Use a spreadsheet for a typical modelling task (j) Use a database for a typical data handling task

Learning Outcomes Candidates should be able to:

- (i) Design and use a data capture form;
- (ii) understand the need for validation and verification;
- (iii) apply the concepts of validation and verification in a practical context;
- (iv) describe the basic features of spreadsheet software such as cells, rows, columns, replication, formatting, formulae, functions, automatic recalculation, sorting and graph creation;
- (v) describe the basic features of database software such as fields, records, files, validation, sorting, searching using the Boolean expressions NOT, AND & OR, creation of charts and graphs, different output formats;
- (vi) 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;
- (vii) identify typical tasks for which spreadsheet and other modelling software can be used;
- (viii) identify typical tasks for which databases can be used;
- (ix) use software to carry out a task which will allow modification of rules and testing of hypotheses;
- (x) use data handling software to manipulate and present data.

5.2.4 Data Logging and Control Software

(a) Data logging (b) Program instructions

(c) Control of devices

Learning Outcomes Candidates should be able to:

- (i) identify different types of sensor and suitable uses;
- (ii) identify the advantages and disadvantages of computerised data logging rather than logging data manually;
- (iii) create instructions to respond to data from sensors;
- (iv) write 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;
- (v) identify typical applications involving the use of control and data logging software.

5.2.5 Systems Tasks and Software

(a) Interface software

(b) Electronic mail and Internet browsing

(c) Saving, copying and troubleshooting

(d) Other software tasks

(e) Designing, documenting and implementing IT solutions

Learning Outcomes Candidates should be able to:

- (i) describe the basic features of good interface software;
- (ii) describe the basic features of an electronic mail package;
- (iii) use electronic mail facilities, including attaching documents;
- (iv) identify and use basic features of an Internet browser and a variety of CD-ROMs;
- (v) search for information using key words, including searching the Internet and CD-ROMs;
- (vi) create, edit, save and copy files on a typical computer system;
- (vii) carry out basic troubleshooting activities: e.g. solving why a print instruction produced no printout;
- (viii) identify tasks that may be carried out using other software e.g. using a Computer Aided Design package for designing a house;
- (ix) write a report detailing how a practical solution implemented on the computer relates to a defined task;
- (x) document a solution which has been implemented using an appropriate piece of software, for example describing the purpose of the system and how to use it;
- (xi) produce annotated evidence that a system, which has been implemented, meets user requirements.

Paper 3

5.3 ICT APPLICATIONS, SYSTEMS, NETWORKS AND COMPUTER TECHNOLOGY (FULL COURSE MODULE)

Examples of applications for the Full Course

All the examples of applications for the Short Course, together with the items below, should be studied for the Full Course.

Electronic communications Internet, www, electronic mail, fax, electronic conferencing, portable telephones

Process control robotics in manufacture, production line control

Billing electricity/gas, mail order Crime electronic fraud, police systems, tagging, security systems

Retailing sales, stock control, purchasing, payroll

School Management Systems registration, records, reports, Booking Systems travel, theatre, cinema

Money & Banking Electronic Funds Transfer (EFT), cash machines, cheque clearing, home banking, personal finance systems

Medical applications: General Practitioners' information systems, hospital and pharmacy records, monitoring, expert systems in medicine

Libraries records of books and borrowers, issue of books

Assistance for people with disabilities communication and control devices

Expert Systems/IKBS medical diagnosis, mineral prospecting, chess playing, tax system/benefits advice

Content

- Computer Technology Legal, Economic and Political Issues Relating to the Use of ICT
- Information Systems and Applications Networks (Wide and Local Area Networks)

5.3.1 Computer Technology

(a) Types of hardware (b) Relationship of hardware and software to a variety of applications

(c) Types of software (d) Interface software features

Learning Outcomes Candidates should be able to:

- (i) identify the fundamental differences between microprocessor technology and mainframe technology;
- (ii) describe a range of applications at home and in everyday life where microprocessor technology is used;
- (iii) describe a range of applications in the workplace where either microprocessor technology is used or where mainframe technology is used;
- (iv) identify a range of data collection methods additional to those listed in 5.1.2 i.e. OMR, OCR, MICR, bar-code reader, touch screens, graphics tablet, voice input;
- (v) identify common uses of different data collection methods e.g. MICR in banking, Bar-code reader in supermarket stock control;
- (vi) describe the comparative advantages and disadvantages of using the range of different data collection methods in iv and 5.1.2;
- (vii) identify a range of storage devices or media additional to those listed in 5.1.3 i.e. DVD, CD-R, CD-RW and Zip drives;
- (viii) describe situations when each of the devices/media in vii may be used;
- (ix) describe the comparative advantages and disadvantages of using storage media identified in vii and 5.1.3;
- (x) identify the difference between RAM and ROM, describing their uses;
- (xi) describe voice output, sound, video, animation and how they are used in multimedia systems, identifying typical applications where their use is particularly beneficial;
- (xii) identify different types of software (operating systems, user interfaces, utilities, applications software, programming languages);
- (xiii) identify the main features of a graphical user interface;
- (xiv) identify the main difference between a graphical user interface (GUI) and command line interface, explaining their relative benefits and drawbacks.

5.3.2 Legal, Economic and Political Issues Relating to the Use of ICT

Content

- (a) Data Protection Act (b) Computer Misuse Act (c) Unauthorised access (d) Electronic fraud
- (e) Changing pattern of commerce and industry due to increased use of ICT
- (f) Changing pattern of employment due to increased use of ICT

Learning Outcomes Candidates should be able to:

- (i) describe the main aspects of the Data Protection Act and any subsequent amendments;
- (ii) describe the purpose of the Computer Misuse Act and any subsequent amendments;
- (iii) describe a range of methods for preventing unauthorised access to computer systems;
- (iv) describe what is meant by data encryption and identify when it is used;
- (v) describe the changes to the way businesses work due to the introduction of ICT e.g. automated production lines with less workers and more standard products, automated stock control ensuring stock is kept at correct levels, shopping on the Internet reducing necessity for premises etc;
- (vi) discuss the changes caused by increased use of IT in industry such as size of business/workforce, type of workforce, siting of offices/manufacturing plant;
- (vii) discuss the changes in employment due to the introduction of computers and the increasing use of network technology such as teleworking, flexible hours, job satisfaction, ease of tasks, training, re-training, work monitoring.

5.3.3 Information Systems and Applications

Content

- | | |
|---|---|
| (a) Backups vs archiving of data | (b) Verification and validation methods |
| (c) Batch processing, on-line and real-time processing | (d) Systems cycle |
| (e) Control-feedback loop | (f) Information systems investigation methods |
| (g) Form design | (h) File design |
| (i) Output design | (j) System implementation strategies |
| (k) Information Knowledge Based Systems (IKBS) and expert systems | (l) Mail merging |

Learning Outcomes

Candidates should be able to:

- (i) describe the difference between data which is backed up and data which is archived;
- (ii) describe verification methods: double entry and visual checks;
- (iii) describe a range of validation checks and their suitability in certain circumstances: including range checks, invalid character checks, member lists, check digits;
- (iv) define batch processing, real-time processing and on-line processing identifying the circumstances when it is necessary to adopt each different method of processing;
- (v) identify the main stages of the systems cycle: investigation and analysis, design, development and testing of a working system, implementation, monitoring, maintenance;
- (vi) describe the main components of the control-feedback loop of a closed system: input, process, output, feedback, identifying a typical application using physical variables such as controlling a greenhouse environment or using documents as feedback such as utility billing systems;
- (vii) identify a range of systems investigation methods such as questionnaires, data capture forms, interviews, observations, suggesting situations when each might be appropriate;
- (viii) discuss the advantages and disadvantages of different systems investigation methods;
- (ix) identify the main issues governing design of suitable data capture forms;
- (x) identify the main issues governing the design of screens and reports;
- (xi) identify the main issues governing the design of files: data types, selection of fields, coding of data, validation rules;
- (xii) describe different systems implementation strategies: direct, phased, pilot or parallel running;
- (xiii) describe the purpose of IKBS/expert systems and how they are used for diagnostic work and decision making;
- (xiv) describe the steps necessary to create an IKBS/expert system;
- (xv) describe the steps necessary when mail merging;
- (xvi) describe the advantages and disadvantages of the use of mail merge.

5.3.4 Networks

Content

- | | |
|--------------------------------------|---------------------------------|
| (a) Methods of communication | (b) Network topologies |
| (c) Difference between LANs and WANs | (d) Common network environments |

Learning Outcomes

Candidates should be able to:

- (i) describe different methods of communication such as satellite, cable, radio, optical;
- (ii) describe different network topologies, identifying briefly the relative advantages of each such as star, ring, bus;
- (iii) define the terms Local Area Network (LAN) and Wide Area Network (WAN);
- (iv) describe the difference between LANs and WANs, identifying their main characteristics;
- (v) describe the characteristics and purpose of common network environments, such as intranets and the Internet;
- (vi) discuss the problems of confidentiality of data, including problems surrounding common network environments;
- (vii) identify the need for encryption and authentication techniques when using common network environments like the Internet.

5.4 PROBLEM SOLVING USING ICT (FULL COURSE MODULE)

Content

- Analysis Design Development, Testing and Implementation Documentation Evaluation

5.4.1 Analysis

- (a) Researching a situation using observation, interviews and/or questionnaires and/or data capture forms
- (b) Recording information (c) Identifying problems
- (d) Establishing the information, input, output and processing required
- (e) Identify suitable hardware and software for developing a new system

Learning Outcomes

Candidates should be able to:

- (i) identify methods by which to investigate the problem including questionnaires, data capture forms, observation and structured interviews;
- (ii) record information/data;
- (iii) analyse the data and tasks carried out, identifying problems with the current methods and procedures;
- (iv) work out the user and information requirements necessary to resolve the identified problems;
- (v) specify the required hardware and software;
- (vi) document the system requirements for later reference during evaluation.

5.4.2 Design

- (a) Designs for documents and files (b) Design forms/inputs (c) Design outputs
(d) Validation (e) Use of diagrams to describe system processing

Learning Outcomes

Candidates should be able to

- (i) design and document data capture forms and screen layouts;
- (ii) design and document report layouts, screen displays and other forms of output (e.g. audio output);
- (iii) specify any verification and validation required and interactive feedback required if any data is input in error;
- (iv) design the required data/file structures necessary to solve the inefficiencies/problems indicated in the requirements specification;
- (v) design the new methods/procedures/processing required to meet the user requirements, drawing diagrams to represent the new design.

5.4.3 Development, Testing and Implementation

- (a) Create the required data/file structures
- (b) Create inputs/outputs and set up any validation specified in the design
- (c) Designing test data to test normal, abnormal and extreme circumstances
- (d) Test the system
- (e) Specify implementation method: direct changeover, phased implementation or parallel running

Learning Outcomes Candidates should be able to

- (i) develop the data structures of the design using the appropriate features of a software package;
- (ii) develop the input/outputs and validation checks for their user using the appropriate features of the chosen software;
- (iii) identify, develop and document a test strategy for the design, ensuring that normal, abnormal and extreme circumstances are tested;
- (iv) test the new system, illustrating how improvements are carried out as a result of testing;
- (v) produce detailed and annotated output from the testing to show how the system works;
- (vi) devise a strategy for system implementation.

5.4.4 Documentation

- (a) The purpose and limitations of the system (b) The hardware and software requirements of the system
- (c) How to use the system (d) Input and output formats
- (e) Sample runs (f) Error messages

Learning Outcomes

Candidates should be able to

- (i) describe the purpose of the system and its limitations to the user;
- (ii) describe the hardware and software required to run the system;
- (iii) describe how to use the system, illustrating the system in use by providing annotated output;
- (iv) describe the inputs, validation and any outputs from the system;
- (v) produce a section on troubleshooting errors for the user;
- (vi) produce documented evidence that the system works as part of the project report.

5.4.5 Evaluation

- (a) Comparing the solution with the original design
- (b) Conclusions drawn from the testing and any modifications and improvements made

Learning Outcomes Candidates should be able to

- (i) evaluate the final system against the criteria described in the requirements specification;
- (ii) evaluate the users' responses to testing the system or end results of testing;
- (iii) 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.