CAMBRIDGE
INTERNATIONAL EXAMINATIONS

IGCSE Computer Studies

Syllabus for Examination in 2004

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

Computer Studies

Syllabus code: 0420

CONTENTS

INTRODUCTION

International General Certificate of Secondary Education (IGCSE) syllabuses are designed as two-year courses for examination at age 16-plus.

All IGCSE syllabuses follow a general pattern. The main sections are:

Aims
Assessment Objectives
Assessment
Curriculum Content.

The IGCSE subjects have been categorised into groups, subjects within each group having similar Aims and Assessment Objectives.

Computer Studies falls into Group V, Creative, Technical and Vocational, of the International Certificate of Education (ICE) subjects together with Accounting, Art and Design, Business Studies, Child Development, Design and Technology, Food Science and Music.

The booklet *IGCSE: An Introduction* gives fuller details of ICE and the general pattern of the syllabuses.

This syllabus is designed for students taking Computer Studies as a single subject. For excluded combinations with other subjects, see *IGCSE Syllabus Synopses* for 2004.

This Computer Studies syllabus is independent of other syllabuses at this level and it includes no significant mathematical or numerical content. The intention of the syllabus is that students should gain a knowledge of the nature of information processing and the broad range of its applications, together with a general understanding of how an information processing system is designed to suit a particular application and how such a system works. The syllabus concentrates on the principles of information processing so that, although students will study contemporary hardware, software and applications as examples, they should be well equipped to appreciate future developments in the technology and its applications. Computing is an applied subject and, to reinforce the practical aspects, all candidates are expected to do practical work.

AIMS

The aims of the curriculum are the same for all candidates. These are set out below and describe the educational purposes of a course in Computer Studies for the IGCSE examination. They are not listed in order of priority.

The aims are to:

1. develop in students an appreciation of the range and power of computer applications;
2. foster an interest in, enjoyment of, and confidence in the use of computing;
3. develop students' abilities to solve problems using computing techniques;
4. develop an awareness in students of the place of computing in society and issues computing raises in society;
5. provide students with a firm understanding of the basic techniques and knowledge required for computing applications;
6. foster a desire to use computers within other interests.

ASSESSMENT OBJECTIVES

The three assessment objectives in Computer Studies are:

A Knowledge and understanding

B Problem-solving and realisation

C Communication

A description of each assessment objective follows.

A KNOWLEDGE AND UNDERSTANDING

Candidates should be able to demonstrate knowledge and understanding of computing, in relation to:

1. the range and scope of information processing applications;
2. the effects of the use of computers, both practical and social;
3. the range of equipment, tools and techniques used to solve problems;
4. the functions of the main hardware and software components of information-processing systems;
5. appropriate terminology.

B PROBLEM-SOLVING AND REALISATION

Candidates should be able to:

1. identify problems within the field of information processing;
2. analyse problems by considering relevant functional, practical, human and economic factors;
3. draw up specifications for the computer-based solutions of problems;
4. select from a range of resources those which are most suitable for solving problems;
5. develop solutions using appropriate methods;
6. implement solutions using equipment, tools and techniques sensibly;
7. test, evaluate and refine solutions systematically;
8. document solutions to problems.

C COMMUNICATION

Candidates should be able to:

1. interpret and organise information;
2. recognise and present information in a variety of forms;
3. communicate in appropriate ways information about applications of computers, problems and their solutions.

SPECIFICATION GRID

	Written Paper	Coursework	Total
A Knowledge & understanding	30	5	35
B Problem-solving & realisation	20	15	35
C Communication	25	5	30
TOTAL	75	25	100

ASSESSMENT

SCHEME OF ASSESSMENT

All candidates will be required to demonstrate basic levels of knowledge and understanding. The skills will usually be tested by requiring recall of information together with some simple application of that information, or explanation. All candidates will also be required to demonstrate some level of practical skill through the project. Abilities to comprehend, analyse, explain, synthesise and justify, to varying degrees will usually be tested in a fairly straightforward way, using information and situations which should be broadly familiar to candidates.

All candidates will be entered for Papers 1 and 2.

Paper 1 (2 ½ hours)

Short-answer and structured questions with no choice.

Paper 2, Coursework (School-based assessment)* - Project

A single piece of coursework of a substantial nature, involving the use of a computer to solve a specific problem, is to be carried out over an extended period. This will enable the students to use their skills and experience gained during the course to solve and document the solution to a problem.

Teachers may not undertake school based assessment of coursework without the approval of UCLES. This will only be given to teachers who are able to satisfy UCLES requirements regarding the marking and internal moderation of coursework.
UCLES offers schools in-service training opportunities and Distance Training packs for teachers who do not meet these requirements.

The general coursework regulations published in the *IGCSE Syllabus Synopses* describe the requirements and give guidelines for school-based assessment of coursework.

The purpose of the project is to allow candidates the opportunity to demonstrate their ability to undertake a substantial piece of work, which is a computer-based solution to a significant problem, and to complete the solution and present their results. The project may involve candidates writing their own computer programs in order to solve the problem but equally candidates may use existing software application packages to solve their problem. In either case the solution must be fully documented. The mark a candidate can achieve is often linked to the problem definition and therefore guidance from the teacher will be needed in the choice of problem. All projects are subject to external moderation by UCLES.

Projects will be assessed under the following headings

Analysis	13 marks
Design	13 marks
Implementation	4 marks
Testing	7 marks
Documentation	5 marks
System maintenance	5 marks
Technical skill	3 marks
TOTAL	50 marks

Further information on Coursework projects and guidance for their assessment appears in 'Notes for the Guidance of Teachers'.

WEIGHTING OF PAPERS

Paper	*Weighting*
1	75%
2	25%

CURRICULUM CONTENT

This syllabus must be read as an integrated whole and not as a progression. The sections overlap and interrelate and the order of the sections reflects a top-down view of the subject: a study of the applications of computers and the effects of their use is supported by a study of the design processes, methods and mechanisms which underlie such applications.

The sections of the syllabus follow.

1 Applications of computers and their social and economic implications.
2 System analysis.
3 Problem solution, including algorithm design and programming concepts.
4 Generic software and the organisation of data.
5 Hardware, systems and communication.

Each syllabus section contains a number of subsections, and there are aims described for each section and objectives for each subsection. The content is presented in a two-column format, with topics listed on the left and notes on the topics on the right. Some topics have no notes while some others have extended notes. **The absence, brevity or length of the notes is not intended to imply weighting to be given to the topic**. It is more to do with whether or not there are suitable, widely available sources of clear and unambiguous information on the topic elsewhere. Where terms are defined in the notes, the definitions are for the purposes of the syllabus; they are not necessarily universal definitions.

It is not the role of an examination syllabus to lay down how a course is to be organised. However, a suggestion of a possible course structure may be helpful; the following should not be viewed as prescriptive.

It is anticipated that a successful course based on this syllabus could start with a study of a simple application, including topics from throughout the syllabus which relate to that application, and that this pattern could be repeated with applications from a variety of areas and of increasing complexity. Within this overall structure there would need to be some periods when particular topics in the syllabus were studied in more detail, but, as far as possible, any topics would be studied in the context of their application. In parallel with these studies there would be practical work designed to build upon and illustrate the applications and topics being studied.

When a problem is considered that may be solved using computers, the problem must first be analysed to establish the desired outcome and the information requirements. This is followed by the design of a suitable overall system. The parts of the system and the interactions between the parts then need to be specified in detail and an appropriate form of solution selected for each of these parts. In order to implement the solutions effectively, suitable data organisations, algorithms, software and hardware components need to be chosen, and appropriate tools and techniques used. Some understanding of the underlying system software and architecture assists in the sensible and efficient uses of resources in the implementation of solutions.

SECTION 1

Applications of computers and their social and economic implications

The aim of this section of the syllabus is to cover as broad a range of computer applications as possible, so as to provide an understanding of the power and versatility of the computer and the benefits of its use, and also its limitations and the problems and potential disadvantages of its use.

1.1 The range and scope of computer applications

Candidates should be able to demonstrate a knowledge and understanding of a wide variety of computer applications. They will not be expected to have specific knowledge of every kind of application, but should be able to comment sensibly on any suggested application and make use of specific relevant examples for illustration.

General application areas:	The range of computer applications is vast. An awareness of this range and of the nature of a variety of application areas is best achieved through a general study of a number of applications of different kinds. The relevant aspects of any application include the following: 1 The purpose of the application. 2 The required outcome. 3 The overall system design, including both the computerised and the non-computerised parts of the application. 4 The necessary inputs to the system and the means by which any data is captured. 5 The overall organisation and processing of the data within the system. 6 The use and organisation of the major software and hardware components of the system. 7 The need for recovery in the event of a system failure. 8 The interface between the system and its users. 9 The effectiveness of the system in practice. 10 The effects of the application on individuals and organisations. There are many examples in each application area and some are listed below. Candidates will be expected to have studied a varied sample of these.
Communication and information systems, on-line services, remote databases;	Examples could be selected from electronic mail, fax, electronic conferencing, digital telephone facilities, information retrieval and database systems, office automation, library systems, viewdata systems, multimedia systems, e-commerce, wireless technology, the Internet and virtual reality.
Commercial and general data processing;	Examples could be selected from banking systems, hospital administration, systems for personnel records, stock control and order processing.
Industrial, technical and scientific uses;	Examples could be selected from weather forecasting, computer aided design and manufacture, image processing and industrial inspection systems, simulation and modelling.
Monitoring and control systems;	Examples could be selected from monitoring of hospital patients, chemical process control, nuclear power station operation and traffic survey and control.
Automation and robotics;	Examples could be selected from domestic equipment, automatic navigation systems, automatic fuel-injection systems and industrial robots.
Expert systems and artificial intelligence;	Examples could be selected from mineral prospecting, medical diagnosis and speech recognition.

Miscellaneous areas such as education and training, entertainment.	Examples could be selected from computer-based learning, computer aided instruction, applications in music, computer graphics and animation for television and film, arcade and adventure games.

1.2 The social and economic implications of the use of computers

In addition to knowledge about applications, candidates should be able to demonstrate a broad knowledge of the economic reasons for using computers and the effects of their use across a range of application areas. They should be able to formulate a reasoned view of the potential effects of any suggested application or development and to show their critical abilities in balancing the advantages and disadvantages of a computerised system.

Social and economic effects on people and organisations associated directly with the application, on other individuals and organisations, and on society in general;	The social and economic effects of the use of computers should be discussed in the context of particular computer applications, with any general principles being based upon real examples. For example, the de-skilling brought about through the replacement of skilled and semi-skilled labour by micro-processor-controlled systems in manufacturing; the process of electronic scabbing which allows managers to switch word-processing duties from striking clerks in one country to non-strikers in another; the ability of unions to maximise impact by selecting computing staff for strike action; the benefits to unions and to management of "new technology" agreements leading to greater productivity and better working conditions.
Economic reasons for the use of computers;	
Changes to existing methods, products and services;	
Development of new products and services;	
Changes in the working environment;	
Changes in employment, retraining;	Candidates may see the need for constant retraining of staff as existing packages are upgraded and new ones published. Candidates may appreciate the use of individual training packages that use CD-ROM and multimedia.
Privacy and integrity of data;	
Data protection legislation;	
Security and reliability;	The requirements for security and reliability vary considerably depending on the nature of the application. For example, a failure during a batch update of a sequential master file is irritating and will cause delay, whereas a failure in an air traffic control system could well have catastrophic results.
Consequences of system failure;	
Hacking and other computer crime;	Computer crime includes activities such as the cracking of ineffective security systems so as to gain unauthorised access to commercially sensitive or confidential personal files, and fraud through the improper transfer of funds from one account to another. Computer criminals may work within the organisation suffering the crime or may be outsiders. Measures taken to combat computer crime include physical security, development of complex security codes and systems, encryption of sensitive data, and monitoring of all attempts to access the system, whether successful or not.
Computer viruses.	Sensible precautions should be identified.

SECTION 2

Analysis of the system

The aim of this section of the syllabus is to cover the main principles of the analysis of the system which are problem definition, feasibility study, investigation and fact finding. This is achieved partly through the study of computer applications, in particular the methods by which a problem has been analysed to lead to a successful solution for the user, and partly through practical work.

Systems analysis

Candidates should be able to describe the main steps involved in systems analysis and they should be able to use charts and diagrams. They should be able to apply the principles of systems analysis in their coursework projects.

Identification of the problem and stating it briefly. Deciding and stating specific outcomes which are desired in the solution of a particular problem.	A variety of problems/solutions may be examined beginning with the relatively simple and proceeding to the more complex. The aim should be to develop a feeling for standard stages which would be appropriate during systems analysis.
Analysing the flow of information and data in existing (computer or manual) solutions. Evaluation of existing solutions. Consideration of alternative solutions.	The ability to describe a problem and its solution in simple non-technical terms should be developed in a similar way.

SECTION 3

Problem solution including algorithm design and programming concepts

The aim of this section of the syllabus is to cover the design, development, implementation, maintenance and review principles, which include techniques and tools which relate to the solution to a problem. A study of these topics is reinforced through practical work and illustrated by a consideration of existing problem solutions in computer applications.

3.1 Making an overall plan.	Most of this work is encountered through practical exercises.
Defining the scope of separate modules.	
Designing algorithms which relate clearly to the requirements of the system.	
Explaining algorithms and how they relate to the system.	
Explaining how hardware needs arise from the output required from the system.	
Algorithm tools.	Top-down design, structure diagrams, flowcharts, menus, libraries of procedures and subroutines.
Interpreting and testing algorithms.	Candidates should be able to work out the purpose of an algorithm, perhaps with the help of a dry run, and to suggest and apply suitable test data.

3.2 *Candidates should have experience of representing algorithms informally (as structure diagrams, flowcharts, step sequences, descriptions) and more formally in pseudocode. Candidates should appreciate the main requirements of a programming language, to allow manipulation of data of various types and structures, including control of input and output, and to provide for selection, repetition and subprogram intercommunication. Candidates should have a simple understanding of the functions of interpreters, compilers and assemblers, and an appreciation of the benefits offered by the existence of a range of languages, both high and low level.*

The concept of a program.	Candidates will not be expected to code in any particular language but they should be familiar with the concepts of sequence, selection and repetition.
High-level languages.	
Low-level languages.	
Pseudocode structures.	Repeat ... Until. If ... Then ... Else ... Endif. Case of ... ... Otherwise ... Endcase. While ... Do ... Endwhile.
Documentation. User documentation, technical documentation.	Candidates should be able to distinguish between the documentation required by users and that required by those responsible for improving and maintaining a solution in working order or for developing the solution to meet new needs.

SECTION 4

Generic software and the organisation of data

The aim of this section is to acquaint the candidates with a broad view of generic software packages. It is expected that these will be experienced through practical work. Although candidates may choose to become expert in the use of a particular package, only a general knowledge is required of the kinds of features typical of generic packages.

4.1 Software for word-processing, database management, spreadsheets, graphics, communications, multimedia, data logging, CAD programming, desktop publishing and web design.

How applications packages solve sets of standard problems. Typical problems capable of solution by packages. Use of standard techniques or routines for established forms of processing (for example, file processing, sorting, simulation).	Candidates should appreciate ways, including import and export, of using programming, desktop publishing, word-processing packages, spreadsheets, databases, graphics packages, information retrieval packages, and show an understanding of the use of graphical user interfaces, communications software (including e-mail), web browsers and search engines and authoring packages. They should appreciate the virtues and disadvantages of integrated packages, and of generic packages compared with specially written software and how packages may be customised by the use of macros. They should be able to explain the use of the tools associated with data logging.

4.2 Data

Candidates should be aware of the standard methods of data collection, verification and validation, and where it is appropriate to use particular methods.

Candidates should understand that data, particularly data held in files, requires access in different ways depending on the particular application. The medium on which the data is stored, and particularly the way in which it is organised, depend on the requirements for access. Candidates should be familiar with the idea of file ordering and the principles of sorting and merging. They should have experience of sequential file processing and of processing individual records by means of record keys.

The relationship between information and data; the collection of data; methods of ensuring its correctness (including validation and verification and the distinction between these); the coding of data for input; the presentation of useful information from processed data; analogue-to-digital and digital-to-analogue conversions.	Candidates should be able to describe methods of data collection, verification, validation and presentation, and give examples of analogue-to-digital and digital-to-analogue conversion. Candidates should be able to select and justify appropriate methods of data collection, verification, validation and presentation, and assess the use of physical variables such as temperature and pressure to control processing activities.
File organisation: different forms of organisation, depending on the data stored and the requirements for processing; processing methods.	Candidates should be able to describe the need for and the simple processing of files, and select with reasons appropriate file organisation and processing methods for a particular application, and understand routines used for file maintenance such as updates, insertions and deletions.
Data types: numbers, characters, strings, arrays, the need for different data types and structures to represent the data of problems which are being solved using a computer.	Candidates should be able to identify the different forms of data and representations for processing which relate to a given simple problem, and explain the need for different data types and structures and how these relate to the data of a given problem.

SECTION 5

Hardware, systems and communications

The aim of this section is to draw together the experience of various kinds of hardware and types of processing, and to examine the concepts of operating systems and communications.

5.1 Hardware

Computer, microcomputer, microprocessor, standard input and output devices, broad classes of processor power;	Students should be able to identify the use of microprocessors in everyday objects such as cameras, digital watches, etc.
The functions and characteristics of storage media;	The functions and characteristics of storage media such as CD-ROM, DVD, RAM, ROM, discs and tapes need to be considered in relation to the requirements for applications.
The characteristics and performance of a range of peripherals (including control and communication devices).	Candidates should be able to discuss the suitability of different peripherals for various applications.

5.2 Systems and communications

Operating system facilities:

The nature of batch, on-line, multi-access, real-time transaction processing, multitasking, network and process-control operating systems; The form of interface between the operating system and the user; use of command line and use of graphical user interfaces;	A real-time transaction processing system is an online system in which individual, discrete transactions are processed as they occur, an airline booking system and an online stock control system are typical examples. This use of the term real time differs from its use in a real-time process-control system, in which physical quantities are continuously monitored and processed sufficiently rapidly to be capable of influencing the sources of data.
Management of files; file directories;	The need for and use of facilities to copy, move, list, print files. The use of sub-directories.
Peripheral device control; use of buffers; interrupts and interrupt priorities; polling; handshaking; check sums.	For an interrupt system the external device or event interrupts the processor, whereas in a polling system the processor interrogates the device or status register. These two alternative methods have very different processing requirements. Adding together all of the elements (for example, bytes) of a block produces a single element known as the check sum. This can then be stored with the block and provides a check when the block is transferred.

5.3 Types of system

Candidates should be able to distinguish between the different types of system, to describe what is needed to support them, to explain which is the most suitable for any given application and to discuss the consequent implications for the user. Candidates should be able to describe particular problems in the management of the various types of system, such as conflicting access to common data or critical timing considerations.

Batch processing systems	In broad terms, a batch processing system is one in which a job is processed without any direct interaction between the job and the user. Typical applications are payroll and billing systems.

Single-user online systems Multi-user online systems	In contrast to this, an online system provides for interaction between the job and the user, which may influence the future course of processing. Such systems may be single-user (for example, a personal computer) or multi-user. Typical applications are word processing and online information retrieval.
Network systems	A network system is one in which processing is carried out independently in more than one location, but with shared and controlled access to some common facilities which normally include file storage and information resources. Star networks, linear networks and ring networks should be compared. Candidates should understand the need for local and shared resources and gateways, for accessing the wide area network (WAN).
Control systems	In a control system, one or more computers is used to control the operation of some non-computer equipment, usually involving some monitoring and logging of physical quantities, providing some analysis of performance and allowing some user interaction. Feedback is an essential element in most control systems. Timing considerations are often critical and the term real-time control system is sometimes used to indicate this. Control systems are used in applications such as oil-refining, chemical processing and integrated traffic-control systems.
Automated systems	Automated systems are broadly similar to control systems but are dedicated to a particular task, and lack the ability to collect and analyse data and the flexibility to allow for and act on user interaction beyond a very simple level. Examples are the systems found in equipment such as washing machines and cameras.
Multimedia	Candidates should be able to specify minimum hardware and software requirements for multimedia applications, and describe typical features and uses of multimedia systems.

NOTES FOR THE GUIDANCE OF TEACHERS

Introduction

These notes are intended to provide assistance for teachers preparing candidates for the IGCSE Computer Studies examination. They contain notes of equipment, facilities and resources and sources of further information. Particular attention is given to approaches to practical work and to the project which is required as part of the examination.

Equipment and facilities

Computer Studies is a practical subject and the IGCSE syllabus places emphasis on the use of commercial and other major packages and on the applications of computers. Centres must ensure that the equipment and facilities provided are adequate for candidates to be able to satisfy the requirements of the syllabus. The hardware facilities needed will clearly depend on the number of candidates, but should be sufficient for all candidates to have enough time to become fully conversant with both systems software and applications packages, and possibly to develop their own software. The software available needs to be sufficient in quality and range to enable candidates to experience a variety of applications of computers in a practical way, as required in the syllabus.

Hardware

It is required that candidates have access to a system with direct-access file capability on backing store and hardcopy facilities for both text and graphics.

The principal danger of using microcomputers exclusively is the impression gained by many candidates that all computing is exemplified by the facilities of the microcomputer. Candidates would find it useful to visit such places as retail outlets, libraries, factories, banks and so on, in order to see the need for large computer systems.

Software

Access to a wide variety of software packages is very important. Such software packages should include word processing, spreadsheets, information retrieval/file management systems, desktop publishing and graphics as well as facilities for dealing with data-logging.

Candidates should have experience of using systems software and of using utility programs, such as routines for data transfer, sorting, searching and merging.

Reference books

This rapidly changing subject presents Centres with many problems concerning the provision of textbooks. The British Computer Society (BCS) booklists for Centres and colleges lists books which are suitable for use as reference books. Teachers will need to consult several books to cover all of the syllabus adequately. A suggested book list is given in the Distance Training Manual and on our website. Many schools will prefer to have a wide range of reference books rather than a class textbook.

Practical work

Computing is a practical subject and the study of most parts of the syllabus will need to be supplemented by a range of practical exercises.

It is important that as early as possible in the course candidates be encouraged to develop a systematic approach to practical problem-solving using appropriate resources.

In addition to the practical work which candidates do throughout the course, there is the requirement for one significant piece of practical work to be presented for assessment.

General Practical Work

Candidates will need to be taught the techniques of problem solving. This involves the definition of the problem, the choice of a method of solution, the selection of the appropriate resources and the documentation of the solution.

The definition of the problem consists principally of specifying the desired outcome.

The method of solution includes the breakdown of the problem into sub-problems, a description of the processes to be carried out, and design of the presentation of the results. It should also take into account the implications for human resources, as well as appropriate resources which may be standard or purpose-designed hardware, general or special-purpose packages, program generators **or** a programming language.

The documentation of the solution is in two parts. The first contains general information about the problem and its solution which enables a user to make effective use of the solution. The second provides technical information about the solution which explains and justifies its design and is sufficient to allow maintenance and development.

Candidates will find it easiest to use a top-down approach. When the problem has been carefully defined, the algorithm for its solution is broken down into component parts at successively lower levels in small sections known as modules.

Assessed Practical Work (The Coursework Project)

One significant piece of practical work must be presented for the purpose of the examination. The weighting given to this work is 25% and it follows that this is a very important part of the course. The teacher acts as supervisor of the candidates and is required to carry out the assessment in accordance with the instructions on the Individual Candidate Record Card. Candidates must not work jointly with others on the same project.

In the role of supervisor, the teacher should do the following.

(a) Help each candidate to choose practical work which is within the candidate's capability and range of interests.

Good project topics are open-ended in the sense that if the work proves to be easier or the candidate more able (and enthusiastic) than the teacher first thought, it can be developed further. Similarly, if the work proves more difficult or the candidate less able than was first thought, it should be possible for it to be simplified.

(b) Ensure that candidates start their documentation as soon as they start the work.

The early documentation may need revision before it is finally submitted.

(c) Insist on seeing a written description of the aims of the practical work before it is started.

At this stage the teacher can discuss the need to use material not covered elsewhere in the course, possible reference sources, and the choice of programming language that should be used. The amount of time that the candidate should spend on each stage should be discussed, and the candidate should be told (and periodically reminded) of the final date for submission to the teacher. Teachers are advised to set this date at least one month before the final date that assessed practical work has to be submitted to CIE for moderation.

(d) Closely supervise the work throughout.

Documentation should be provided by candidates and regularly inspected by the teacher. Detailed assistance may be given if necessary, but the amount of help of this kind must be taken into consideration when assessing the work. A note about the assistance given must be included in the appropriate place on the Individual Candidate Record Card.

(e) Insist that candidates maintain back-up files that can be used if necessary.

(f) Encourage candidates to specify the use of a word processor to submit documentation so that they may receive due credit.

Any excessive help or guidance will result in a deduction of marks, the level of deduction being decided by the teacher taking into account the amount of help given. However if a Centre makes a deduction for assistance given, then the reason for such deductions must be clearly annotated on the individual assessment form for that particular candidate. If such help forms part of the normal teaching process then no deduction should be made, also if the help enables the candidate to achieve a higher standard without further assistance then again no marks should be deducted. Marks should only be deducted where the teacher tells the candidate exactly what to do and the candidate makes no further progress in that particular area.

Candidates should be made aware that hardcopy output of results is essential except where this is inappropriate (for example in a control application). For projects involving graphics, Centres usually find no difficulty in obtaining photographs of the screen. Where hardware or animated projects are undertaken, photographs and videotapes (VHS) may be sent. Discs and/or CDs should not be sent.

Material taken from magazines or other sources and used in projects must be acknowledged and the supervisor should ensure that this is done.

Suggestions for Practical Work

Candidates may choose to solve their problems by either the use of a software applications package or by writing their own program. The exact method of solution will be the choice of each candidate but the teacher will need to ensure that all options have been covered during the course. The use of a specific programming language will not be recommended by UCLES, any choice of language will be determined by the available resources within the school. However if candidates choose to write their own program then the choice of language must allow them to construct their program in a structured modular approach. Previous experience of candidates' work indicate that the choice of certain projects; games, quizzes, word-processing and some designing websites, make unsuitable projects capable of achieving high marks unless they are both very well designed and documented. The following list is offered as a suggestions but it is in no way a complete list and candidates should be encouraged to think of their own problem.

An invoicing/sales system as part of stock control
Sports league
Running a school tuck shop
Electricity billing system
Airline/theatre reservation system
Vehicle registration
Cruise / Holiday booking system
Estate agency
Website design in HTML
Computer controlled greenhouse, lift, traffic lights/sensors
Analysis of sales figures
Invoice/price list
Income/expenditure for an event
Seat Reservations
Payroll/wages
stock control
Doctor/dentist surgeries
Stock control
Local facilities guide
Sports club/Library/club membership

MODERATION

(a) Internal Moderation

When several teachers in a Centre are involved in internal assessments, arrangements must be made within the Centre for all candidates to be assessed to a common standard.

It is essential that within each Centre the marks for each skill assigned within different teaching groups (for example, different classes) are moderated internally for the whole Centre entry. The Centre assessments will then be subjected to external moderation.

(b) External Moderation

Individual Candidate Record Cards and Coursework Assessment Summary Forms must be received by CIE no later than 30 April for the June examination and 31 October for the November examination along with a sample of the coursework undertaken by the candidates. The samples should cover the full ability range. If there are ten or fewer candidates all the coursework that contributed to the final mark for all the candidates must be sent to CIE. Where there are more than ten candidates all the coursework that contributed to the final mark for ten of them will be required. The Centres should select candidates covering the whole mark range, with the marks spaced as evenly as possible from the top mark to the lowest mark. If appropriate, the samples should be selected from the classes of different teachers. A further sample of coursework may subsequently be required. All records and supporting written work should be retained until after the publication of the results.

Samples of the forms required are on the following two pages.

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

COMPUTER STUDIES
INDIVIDUAL CANDIDATE RECORD CARD
IGCSE 2004

Centre Number						**Centre Name**			
Candidate Number						**Candidate Name**		**Teaching Group/Set**	

Please use the space on the reverse for any comments about the project(s), marking, and help given to the candidate beyond normal supervision. Comments are especially important where the marks awarded differ from what might have been expected on the sole evidence of the submitted material.

Title(s) of Project(s)

	The Problem						Design				Implementation		Testing		Documentation		Evaluation					
	Description of the Problem	Specific Objectives	Description of existing solution	Evaluation of existing solution	Description of other possible solutions	Evaluation of other possible solutions	Overall plan	Description of method of solution	Hardware requirements	Software requirements	Method of solution related to problem	Accurate method of solution	Test strategy	Test results	Technical documentation	User documentation	Evaluation	System development	Technical skill	**TOTAL**	Deduction for teacher assistance	**FINAL TOTAL**
Section	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**		**20**	
Max	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**4**	**3**	**2**	**2**	**3**	**4**	**2**	**3**	**3**	**2**	**3**	**50**	**10**	**50**
							13			13		4		7		5		5	3	50		

17

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

COMPUTER STUDIES
COURSEWORK ASSESSMENT SUMMARY FORM
IGCSE 2004

Please read the criteria printed overleaf and the General Coursework Regulations before completing this form

Centre Number		**Centre Name**		**June/November**	**2 0 0 4**

Candidate Number	Candidate Name	Teaching Group/ Set	Title of Project	Assessment Under Headings 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total Mark (max 50)	Internally Moderated Mark (max 50)	Moderated Mark (max 50)

Name of teacher completing this form		Signature		Date	
Name of internal moderator		Signature		Date	

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

ASSESSMENT CRITERIA FOR COURSEWORK (SCHOOL-BASED ASSESSMENT)

ANALYSIS	1 mark	2 marks	3 marks
1. Description of the problem	Brief description of the background to the business or organisation.	Description of the background to the business or organisation, together with the nature of the problem to be solved.	
2. Objectives **(must be stated in relation to the proposed solution)**	Objectives listed in general business terms, e.g. to make a process faster, to save time or resources.	Objectives listed in computer-related terms, e.g. create a database, sort, search a database, edit a record etc.	Objectives listed in both general business terms and computer-related terms
3 Description of existing solution	Incomplete description of the current solution	A full description of the current solution, including data input requirements (data capture methods and data dictionary, if applicable) and specifications, the data processing and output requirements and specifications.	
4. Evaluation of existing solution	Incomplete evaluation	Complete evaluation highlighting advantages, disadvantages and suggested improvements.	
5. Description of other possible solutions, **(including the proposed solution)**	Description of one other possible solution, **i.e. the proposed solution**	Description of at least two other possible solutions, **including the proposed new solution.**	
6 Evaluation of other possible solutions	Evaluation of the advantages and disadvantages of the alternative solutions.	Evaluation of the advantages and disadvantages of the alternative solutions. The choice of proposed solution should be justified.	

DESIGN	1 mark	2 marks	3 marks	4 marks
7. Plan	Incomplete or unclear plan	Detailed plan, including time schedule.	Detailed plan, time schedule clearly linked to the objectives in section 2.	
8. Description of the method of solution. This could be in the form of top-down design, structure diagrams, flowcharts or pseudo-code.	Unclear or confused method of solution.	Clear method of solution but some aspects of the method of solution are missing.	Clear and detailed description of the method of solution**, including database tables, any relationships.**	
9. Hardware	An incomplete list of hardware.	A complete list of hardware.	A detailed specification.	A detailed specification together with at least two reasons why such hardware is needed **in the context of the proposed solution.**
10. Software	List of software used.	Description of the software used.	Justification as to why this software is being used or written.	

IMPLEMENTATION	1 mark	2 marks
11. Method of solution related to the problem by suitable means, including the use of annotated listings or pseudo-code.	Method of solution described in generic terms.	Method of solution described in specific details relevant to the problem.
12. Accurate method of solution	Partly successful, **some objectives achieved as listed previously.**	Completely successful, **all objectives achieved as listed previously.**

TESTING	1 mark	2 marks	3 marks	4 marks
13. Test strategy	Incomplete test strategy, which should include the data to be tested together with the expected results.	Complete test strategy, which should include the data to be tested together with the expected results.	Complete test strategy, which should include the data to be tested together with the expected results and linked to the objectives in section 2.	
14. Test results (Normal, extreme and abnormal data)	One type of data tested.	Two types of data tested.	All three types of data tested.	All three types of data tested and linked to the objectives in section 2.

DOCUMENTATION	1 mark	2 marks	3 marks
15. Technical documentation	Inadequate documentation	Satisfactory documentation **which would enable maintenance or modification of the system.**	
16. User documentation	Inadequate or unclear details	Clear details but incomplete	Clear and complete user guide.

SYSTEM EVALUATION & DEVELOPMENT	1 mark	2 marks	3 marks
17. Evaluation	Inaccurate or trivial evaluation .	Reasonable evaluation.	Reasonable evaluation linked to the objectives in section 2.
18. Developments(The candidate does not necessarily have to be capable of carrying out these suggestions).	Some improvements suggested.	Realistic and meaningful suggestions for development.	

TECHNICAL SKILL	1 mark	2 marks	3 marks
19. Technical skill	Basic use of the software.	Competent average skill.	High level of skill in using the software.

GRADE DESCRIPTIONS

A **Grade A** candidate will demonstrate knowledge and understanding of the curriculum and the ability to analyse, explain, synthesise and justify the concepts encountered, together with the ability to apply knowledge and skills through practical work.

A **Grade C** candidate will show knowledge of the curriculum, will demonstrate some ability to analyse, explain, synthesise and justify concepts encountered, and will be able to produce a substantial coursework project.

A **Grade F** candidate will show competence in much of the curriculum, and will demonstrate some practical skill in the coursework project.

Copies of syllabuses, past papers and examiners' reports can be ordered using the IGCSE Publications Price List/Order Form.