ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

CURRICULUM DEVELOPMENT AND TECHNICAL SERVICES

COMPUTER SCIENCE

SECONDARY SCHOOL LEVEL

FORMS 1 - 6

2015-2022

TEACHER'S GUIDE

Curriculum Development Unit
P.O.BOX MP133
Mount Pleasant
Harare

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ORGANISATION OF THE TEACHER'S GUIDE

This Teacher's Guide is divided into two parts, namely, Part A and Part B.

Part A covers the critical documents which you the teacher must have in order to cover the curriculum effectively. The critical documents are:

- The Curriculum Framework for Primary and Secondary Education 2015-2022
- The School Syllabus
- Schemes of work
- Lesson Plans
- Progress Records
- Register of attendance
- Learner Profiles.

Part B deals with curriculum delivery namely the Content, Objectives, Methods and Instructional materials, Classroom Management, Assessment and Evaluation.

PART A

CRITICAL DOCUMENTS

INTRODUCTION

This Teacher's Guide assists you the teacher in handling the Computer Science learning area. After going through this guide, it is hoped that you will be better able to guide learners in handling this learning area. Accordingly, the guide's main thrust is on the learning and teaching of Computer Science to learners.

As a teacher it is important for you to have access to the following critical documents in order to deliver the Computer Science Curriculum effectively:

- Curriculum Framework
- National Syllabus
- School syllabus
- Schemes of Work/Scheme Cum Plan
- Lesson Plans
- Learner Profiles
- Progress Records
- Register of Attendance

RATIONALE

Computer Science requires learners to pay close attention to developing adequate life and career skills. It adequately equips today's learners in entry-level work and beyond, in further study and lifelong learning, and in their personal lives as inquisitive, reflective, discerning and caring citizens. ICT is significantly enhancing and altering human activities, enabling us to live, work and think in ways that most of us never thought possible. Since technology has an increasingly significant impact, and such broad implications for every individual, groups and entire nations, learners must be prepared to understand, control use and apply ICT in effective and efficient ways.

OBJECTIVES

It is hoped that after going through this unit, you will be able to:

- Implement this Computer Science Syllabus
- manage your class effectively
- mobilise the teaching and learning resources
- prepare appropriate, engaging teaching aids
- track the learner's progress during the learning process

UNIT 1

CURRICULUM FOR PRIMARY AND SECONDARY EDUCATION (2015 -2022)

INTRODUCTION

The Curriculum Framework 2015-2022 gives a vision and direction of the education system of Zimbabwe and the kind of a school graduate that Zimbabwe needs. It is important for you as a teacher to read and be familiar with the contents of the Curriculum Framework as a policy document to guide you through the implementation of the New Curriculum.This policy document outlines underpinning principles, national philosophy, learning areas, the description and expectations of MOPSE at policy level. It prescribes what the government expects you to deliver as you go about your duties.

OBJECTIVES

By the end of this unit you should be able to:

- understand the contents of the Curriculum Framework
- comprehend the contents of the Secondary school curriculum as a policy to guide you through the implementation of the new curriculum
- understand the principles underpinning the new curriculum
- read and understand the key competencies expounded in the Curriculum Framework

KEY ELEMENTS OF THE CURRICULUM FRAMEWORK

Here are some of the key elements/components that are covered in the curriculum framework:

- Principles and values guiding the curriculum. These include the following among others:
  - Philosophy underpinning the curriculum
  - Policy guidelines
  - Generic principles guiding the curriculum
  - Learner exit profiles
  - Knowledge
  - Skills
  - Values
  - National identity

- Goals of the curriculum
  - Organisation of the school curriculum

  - Secondary school goals
  - Learning outcomes
  - Learning areas
  - The learning areas at Secondary School Level

  - Visual and Performing Arts
  - Physical Education
  - Mass Displays
  - Indigenous Languages
  - Mathematics and Science
  - Heritage -Studies
  - Information and Communication Technology (ICT)

- Cross-cutting and emerging issues in the Secondary school curriculum
  - Languages
  - Science and Technology
  - Mathematics
  - (LOP) Life Orientation Programme
  - Visual and Performing Arts
  - Physical Education, Sport and Mass Displays
  - Agriculture
  - Family and Religious Studies (FRS)
- Learning Areas at Secondary school Level (Form 1to Form 4)
- Learning Areas at Forms 5 and 6
- Teaching and learning methods
- Assessment and learning
  - Assessment of skills, abilities and knowledge
  - Relevance of school-based continuous assessment
  - Assessment of learning (formative assessment)
  - Assessment of learning (summative assessment)
  - Performance - based assessment (PBA)
  - Strategies for effective curriculum implementation

UNIT 2

SYLLABUS INTERPRETATION

INTRODUCTION

As a teacher you constitute the backbone of any education system and as such your ability to deliver lessons depends on careful planning. Planning begins with syllabus interpretation, which forms the basis for the development of a National syllabus, School syllabus, Scheme of work and a Lesson plan. You need to learn how to interpret the syllabus correctly

Understanding Syllabus Interpretation

- Simply, it is the process of making sense out of the syllabus.
- Interpretation is about finding meaning.
- It is the process of unpacking the syllabus, analysing and synthesising it.

Interpreting the Syllabus

Syllabus interpretation focuses on the following:

- The national philosophy/vision as spelt out in the preamble (as derived from the Framework).
- The syllabus aims and objectives: This is what the syllabus intends to achieve within the learners.
- The content: This refers to the knowledge, skills, attitudes and competences. Content constitutes the heart of the syllabus. Therefore, syllabus interpretation facilitates breaking down of content into teachable units.

OBJECTIVES

By the end of this unit you should be able to interpret the ICT National Syllabus

TYPES OF SYLLABUSES

Syllabuses are key documents for every teacher. There are two types of syllabuses namely the:

- National Syllabus
- School syllabus

As a teacher, you should be able to interpret the National and the School syllabus and these contain the following components; Aims, content, assessment objectives, methodology and the assessment or examination format

NATIONAL SYLLABUS

It is a policy document that outlines and specifies the learning area philosophy, aims and objectives, learning / teaching concepts and content, suggested methodology and assessment criteria at every grade level. You should always have it and use it to guide you in your day-to-day teaching and learning activities.

The National Syllabus consists of:

- **Aims:** Are broad indications of what the learners should learn
- **Objectives:** Learner behavior at the end of the teaching learning experience (competencies).

- Topics/ Content and activities
- **Methodology:** This must be learner centered. Therefore, teaching approaches to achieve desired learning outcomes must be learner centred. Learner centered approaches allow learners to practice skills and to display their key competencies.
- Instructional or teaching materials
- Assessment

To interpret the syllabus one needs to identify its components and establish links between and among them. Components of the syllabus include:

(a) Cover page

This is the front cover of the syllabus that states the learning area and level.

(b) Acknowledgements

This is the list of those who participated in the development of the syllabus. Names are not mentioned but the organisation that the members represented. Funders of the syllabus, experts or consultants are also acknowledged.

(c) Contents page

This lists the contents of the syllabus and page numbers.

Preamble
The preamble consists of introductory notes to the syllabus. It has five sub-titles.

Introduction: Gives a brief insight into the learning area.

Rationale: This is a justification of why this particular learning area is included in the curriculum.

Summary of content: This is a summary of what should be learnt in a particular learning area.

Assumptions: Pupils do not come tabula rasa into the classroom. That knowledge that we assume they already have is what we call assumptions.

Cross- cutting themes: These are emerging and contemporary issues that cut across all Learning areas. Teachers should find ways of incorporating them in their teaching whenever possible.
These are:

- ICT
- Gender
- Children rights and responsibilities
- Disaster risk management
- Financial literacy
- Sexuality, HIV and AIDS education
- Child protection
- Human rights
- Collaboration
- Environmental issues

N.B Not all Cross-cutting themes can be applied in all learning areas, some are more applicable to particular learning areas than others.

Presentation of the syllabus

This is a description of how the syllabus is presented.

Aims

These are general statements of what the Learning area intends to achieve (major outcomes). They are long term and therefore broad. They generally cover the whole Learning area for example from Form 1 to 6. They cover all domains of Bloom's taxonomy and should carter for all learners (inclusivity).

Syllabus objectives

These are specific competencies of the learning areas and are derived from the aims. In curriculum they should be SMART (Specific, Measurable, Achievable, Result oriented and Time framed).

Methodology and Time allocation

Methodologies are broad approaches that are suggested for a given Learning area. They are guided by the Curriculum Framework's thrust i.e. skills or competence based, promoting critical thinking and problem solving. They are also child centred rather than teacher centred.

Time allocation

This reflects the number of periods and their duration for a particular Learning area.

Topics

These are the main posts or pillars of the content for the levels given in itemised form. They form the core of a given learning area. In some subjects topics may be based on broad skills for example Languages and Practicals. Topics are broken into sub-topics in the competency matrix depending on the learning area.

Scope and sequence

It shows the depth and breadth of the content. Sequence refers to ordering of the information. Information is arranged according to logical ordering of the subject from the simple to difficult concepts. Generally, the same concept cuts across all levels differing in depth as children progress to higher levels. (Spiral approach)

Competency matrix

It is a table that gives the concepts/content to be taught or competencies to be acquired. It is developed from the Scope and Sequence. It includes Topic/Skill, Objectives, Unit Content and Competence, suggested learning activities and suggested resources.

Assessment

This section gives information on how the learning area will be assessed, the weighting and skills to be tested, types of questions and duration of each paper. It gives information on how the three forms of assessments namely; formative, continuous, and summative will be conducted and the percentage allocated to each. It also includes information on profiling. This section also has as-

sessment objectives, scheme of assessment, specification grid and assessment model.

Content

The content for Computer Science include:

6.1 Hardware and Software
6.2 Application of Computer Science
6.3 Data Representation
6.4 Communication Networks and Internet technologies
6.5 Security and Ethics
6.6 Systems Analysis and Design
6.7 Algorithm Design and Problem Solving
6.8 Programming
6.9 Databases
6.10 Web Design
6.11 Technopreneurship

SCHOOL SYLLABUS

Introduction

It is a breakdown of the national syllabus and is drafted at the school level with experts from the learning area. This must be drawn at school level from the National Syllabus by reorganising content taking into account local factors (see unit 2 on Syllabus Interpretation).

Thus a School syllabus is a plan that states exactly what learners should learn at school in a particular learning area for example in ICT. It is a major curriculum document which:

- Prescribes what government would like to see taught in all schools as spelt out in the curriculum framework.
- Outlines the experiences that learners should undergo in a particular course of study for example Infant, Junior and Secondary levels.
- You are required to derive teaching concepts from the syllabus.
- Examinations are set from the syllabus.

Glossary / Appendices

In some syllabuses, there will be a list of explanations of terms and additional information at the end. A list of equipment and reference books might also be found here. As a teacher it is important to have a copy of a School syllabus that is derived from the National syllabus because public examinations are derived from the syllabus.

Drafting the School Based Syllabus

When drafting a school syllabus we must consider the following factors;

- National goals and subject options available on national curriculum list. This states the national identity and philosophy as well as address national needs.
- The learners physical, mental and emotional state:
- **Physical:** Consider disabilities, complexity of manipulative skills.
- **Mental:** Consider level of maturity and cognitive development.
- **Emotional state:** Consider values and attitudes to be developed.
- Resource availability: Consider the facilities and materials available. Consider the qualifications, number, experience and level of training of personnel available.
- Community influences: consider the religion, beliefs and values of local people.

- Evaluation system and strategies: consider how the curriculum is evaluated and whether it will be possible to evaluate effectively in a particular school environment.
- Time allocation in the official syllabus.
- Local conditions that affect the choice and sequencing of topics.
- Education technology.

UNIT 3

SCHEMES OF WORK

This is a document that you should draw from the national and school syllabus. You should outline the objectives, activities, content, and methods (see scheme cum plan template). You should prepare your scheme cum plans two weeks ahead of the lesson delivery date (You can use ICT tools to make your plans)

A scheme of work is a plan for something. Your scheme of work is a plan of action, which should enable you to organize teaching activities ahead of time. It is a summarized forecast of work, which you consider adequate and appropriate for the class to cover within a given period from those topics, which are already in the syllabus. A well-prepared scheme of work does the following:

- Gives an overview of the total course content.
- Provides for a sequential listing of learning tasks.
- Shows a relationship between content and resource materials.
- Provides a basis for long range planning, training and evaluation of the learning area.

A Scheme of work can be made to cover even one term. Each year is divided into three terms, each with approximately three months or thirteen weeks. A scheme of work should be made for each term, ideally before lessons begin. When you are preparing a Scheme of work, you should consider the following:

Understanding the syllabus

You may not have been involved in curriculum development but you are expected to interpret and implement it correctly. This calls for a thorough understanding of the syllabus and the content in order to achieve the stated objectives. Your role is simply to implement the syllabus as it is. It is important for you to be thoroughly conversant with the curriculum in order to implement it successfully.

Syllabus content

Topics in the syllabus may not be arranged in the order they are supposed to be taught. Some topics need to be linked, while others are quite independent. You should both identify essential learning content and arrange it in a logical order. Related subjects should also be considered when scheming. Subject integration should be prioritised where possible

Reference materials

You should be familiar with available reference material necessary for effective coverage of the topics in the scheme of work. You should effectively make use of learning resources in your environment.

Assessment

Learners will be assessed in both continuous and summative methods. Your scheming should reflect this.

Time allocation

Your scheme should be contextual. That is, it should take context of disturbances that may occur during the course of term, such as public holidays, internal examinations open days, sports days, visits from the district and the province.

Objectives

Each lesson should have objectives, which pinpoint the anticipated learning behaviour of the learners. The objectives must be SMART. For example: Learners should be able to identify types of social stratification.

Methods

You should state specific activities that you and the learners will perform, for example naming types of social stratification, discussing, identifying, distinguishing, etc.

Resources

Resources necessary for content coverage should be noted down with relevant page numbers, for ease of referencing during lesson planning. References include books, journals, handouts, magazines etc. Teaching resources also include equipment or apparatus that is available and appropriate. You should not indicate a teaching media that will not be available

Evaluation

This should be done immediately and timely, well before the next lesson. Indicate whether what was planned for has been covered, whether there was over planning or failure of a lesson and reasons for either case to help you in consequent and future planning. Avoid remarks like excellent, O.K, taught, because they are not relevant. Indicate strengths and weaknesses of the lessons taught.

COMPONENTS OF A SCHEME OF WORK

The components of a scheme of work are:

- **Level of learners** - state the level (Grade) of learners you are scheming for.
- **Subject** - indicate the learning area you are scheming for.
- **Week ending** - the date should be clearly indicated
- **Topic** - topics should follow the order, which they are supposed to be taught, from simple to complex.

The layout of a Scheme of Work is usually horizontal and comprises of the following columns:

WEEK ENDING	TOPIC/ CONTENT	OBJECTIVES By the end of the week pupils should be able to	COMPETENCES/ SKILLS	SOURCE OF MATERIAL	MEDIA METHODS/ ACTIVITIES	SUGGESTED	EVALUATION

EXAMPLE OF SCHEMES OF WORK

WEEK ENDING	TOPIC/ CONTENT	OBJECTIVES By the end of the week pupils should be able to	COMPETENCES/ SKILLS	SOURCE OF MATERIAL	MEDIA METHODS/ ACTIVITIES	SUGGESTED	EVALUATION
20/02/ 2017	Computer Hardware and Software Hardware (input, output, storage) devices	-identify different hardware devices -connect hardware devices -troubleshoot hardware devices	Identifying Demonstrating Troubleshooting	-National ICT syllabus Item 8.1. -ICT textbook -Teacher's resource book for the above	ICT tools Charts Pictures	-identifying different hardware devices -connecting hardware devices -troubleshooting hardware devices	

LESSON EVALUATION:

Evaluation should show the strengths, weaknesses of the approaches used in delivering the lessons. It also shows the way forward in terms of remedial activities if need be.

UNIT 4

LESSON PLANS

A lesson plan is a detailed daily plan of what you intend to deliver during the lesson. This is to be used in the event of you having drawn a scheme of work rather than a scheme cum plan. (See Detailed Lesson Plan Template)

By the end of this unit, you should be able to:
- draw up a lesson plan
- identify relevant teaching-learning materials/ Media
- identify appropriate teaching methods
- evaluate the lesson delivery

COMPONENTS OF A LESSON PLAN

The lesson plan involves:
- Preparation (objectives, Media)
- Execution
  - introduction
  - lesson development
  - written work
  - conclusion
  - Lesson evaluation

Below is an example of a detailed lesson plan:

DETAILED LESSON PLAN

Date:	22 February 2017
Form	Form 1
Time:	11.30 -12.05
Learning Area	Computer Science
Topic/Content:	Hardware and Software
Sub-Topic:	Hardware
S.O.M:	ICT Textbook Teacher's resource book
Suggested Media	ICT tools, Charts, Pictures
Number of students	30

Assumed knowledge Learners have some previous knowledge of computer system components

Lesson Objectives

- identify different hardware devices
- connect hardware devices
- troubleshoot hardware devices

STAGE	UNIT CONTENT	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
Introduction	Previous knowledge of learners on components of a computer system	Question and answer session of components of a computer system which they know	ICT Tools
Step 1	Input, output and storage components of a computer system	Group discussion on input, output and storage components of a computer system	ICT tools pictures of robots videos of robots in different environments
Step 2	Connecting computer components	Demonstrations on connecting computer components Learners connect computer system components	ICT tools Multimedia tutorials
Step 3	Troubleshooting computer components	Learners use e-books to troubleshoot computer components	ICT Tools e-books on troubleshooting computer components
Step 4	Input, output, storage devices	Question and answer session on connecting and troubleshooting computer system components	ICT Tools e-books

LESSON EVALUATION:

Strength:.....
.....
Weaknesses:.....
.....
Way Forward .....
.....
.....

UNIT 5

RECORD KEEPING

INTRODUCTION

Records are critical documents about the teaching – learning process, which you must keep as a teacher
They include:

- Syllabuses (National and School)
- Learners' details
- Examination documents
- Mark lists
- Inventory

OBJECTIVES

By the end of this unit, you should be able to:

- identify the various records you are expected to keep
- prepare accurate records
- Interpret information from records to promote learning
- Maintain and keep records safely
- Appreciate the need to update records regularly

RECORDS TO BE KEPT

- Official syllabuses
- School syllabuses
- Records of staff details
- Records of learner details
- Supervision records
- Files, circulars, handouts, past exam papers
- Minutes of meetings
- Inventory of resource materials
- Stock control registers
- Learner Profiles
- Attendance Register
- Progress Records

All these records are very important and you should constantly administer and upgrade them. They should be readily available for supervision.

PART B

CURRICULUM DELIVERY

INTRODUCTION

The Computer Science syllabus provides a broad perspective on the basic knowledge and practical skills on how to use and apply a variety of technologies in everyday life. The syllabus intends to prepare learners for further education or branching to more specific and specialised fields of computing. Learners will be able to use the acquired skills to solve day to day life and work-related problems in the globally competitive information age. The Computer Science syllabus is intended to be infused within other subjects in the school curriculum.

Thus for the effective curriculum delivery of this learning area, learner centred learning methods and activities are encouraged. The use of Instructional teaching learning aids will create virtual realities and thus help the learners to learn fast and capture their interest

OBJECTIVES

By the end of this unit, you should be able to:

- select appropriate teaching methods for your lessons
- design meaningful and effective instructional material
- use a variety of learner-centred approaches
- plan and organize educational tours
- help pupils carry-out projects or experiments
- make good quality aids from available resources (Types: charts, chalkboard, whiteboard, computers, slides, films, videos, flannel graph, textbooks)

CONTENT

This refers to the Subject matter, Topics, Key concepts or Skills to be covered in a learning area. Topics are the main posts or pillars of content for the levels given in an itemised form and are core to the Learning area.

METHODOLOGIES

As a teacher it is important for you to use problem solving and learner–centred approaches. You are the facilitator and the learner is the doer. You should select appropriate teaching methods for your lessons. They should be varied and motivating. The following methods are suggested for you and you should select one or several depending on:

- The subject matter
- Instructional objectives
- The learner
- Your personality
- Learner's level of development (cognitive, affective and psychomotor)
- Content to be covered
- The time
- Instructional materials
- The environment
- Competencies to be developed

It is advisable that the learner be exposed to more than one method in a lesson. Teaching methods can be grouped under three main categories:

a) Cognitive development methods
b) Affective development methods
c) Psychomotor development methods

COGNITIVE DEVELOPMENT METHODS

These are mainly deductive

- Discussion Method
- Questioning/Socratic Method
- Team Teaching Method
- Talk Show/Recitation Method
- Field Trip/Educational tours Method
- Futures wheel
- Group work

AFFECTIVE DEVELOPMENT METHODS

- Modelling Method
- Simulation Method
- Dramatic Method
- Simulation Games
- Role-Playing Method
- Gallery walk
- Observation
- Lecture

PSYCHOMOTOR DEVELOPMENT METHODS

These are more learner activity based and heuristic

- Inquiry Method
- Interactive e-learning
- Discovery Method
- Process Approach Method
- Demonstration Method
- Laboratory/Experimentation Method
- Programmed Learning Method
- Dalton Plan/Assignment Method
- Project Method, case studies, research
- Microteaching Method
- Games
- Mastery Learning
- Song and dance
- Your subject matter should determine the most suitable teaching method/methods to use.
- The instructional objectives to be achieved by the end of the lesson also determine the choice of teaching methods.
- You must be very familiar with the teaching methods you want to use and be convinced they are the most appropriate for that lesson.
- You must consider the age, interest, level of development of the learners and ensure that all learners will benefit from the method you have chosen.
- You must consider time in relation to the methods chosen.
- You should consider the environment and the size of the class in settling for methods to employ.

TEACHING-LEARNING MATERIALS

These are materials that enhance the teaching- leaning process. They assist you the teacher to achieve desired objectives while in learners they help in concretising the concepts. They help learners learn better and faster, motivating them and stimulating interest.

SELECTING APPROPRIATE INSTRUCTIONAL AIDS

When selecting learning media, you have to consider the following;

- Topic
- Level of learners
- Available resources
- Environment
- Number of learners

These teaching / learning media should be of good quality and user friendly considering the available resources in the school. Examples of teaching-learning aids appropriate in ICT are:

- charts
- job cards
- ICT tools
- textbooks
- newspapers
- magazines
- mobiles

Instructional media should be used effectively. They must serve the purpose they are meant for rather than be mere window dressing. You should design your media with the topic in mind. Charts and cards must be clearly written, with visible colours and correct size of script for the level of learners. Electronic equipment should be checked before the lesson so that it is in good working order. If using complicated technical media, make sure you practice beforehand so that you do not embarrass yourself in front of the class.

ASSESSMENT AND EVALUATION

This is the measuring of the success of teaching in terms of teacher and learner performance. It provides you with feedback on the acquisition of knowledge, skills and attitudes by learners.

Evaluation Methods

- Tests and assignments
- Practical assignments

The syllabus scheme of assessment is grounded on the principle of inclusivity. Arrangements, accommodations and modifications must be visible in both continuous and summative assessment to enable candidates with special needs to also access assessments.

ASSESSMENT OBJECTIVES

By the end of the ICT studies course Infant School Level, learners are expected to:
Knowledge and Understanding

- describe a range of information processing systems
- explain the effects of introducing information processing systems both to individuals and to the organizations

explain the functions of individual hardware and software components of ICT systems and their interrelationships

Problem solving

- use computers to generate, implement and document solutions appropriately
- demonstrate knowledge and understanding of the techniques used to solve real life problems
- analyze software programs in terms of data flow and system requirements
- analyze, evaluate, make reasoned judgments and present conclusions

Practical Skills

- develop an understanding of the component parts of computer systems and how they inter-relate
- interpret and organize information
- recognize and present information in a variety of forms

SCHEME OF ASSESSMENT

In order to have a holistic assessment of the learner, learners will be assessed in the following three aspects; formative, continuous and summative assessment with each contributing to the learner's final grade.

Ordinary Level Assessment

The Scheme of Assessment is intended to encourage positive achievement by all learners. The subject will be examined in 5 papers as shown in the table below.

CLASS MANAGEMENT

This is the process of planning, organizing, and leading and controlling class activities to facilitate learning.

CREATING AN EFFECTIVE LEARNING ENVIRONMENT

This covers classroom organization from:

- **Physical environment:**

- Clean, tidy and airy classroom and furniture arranged carefully for safety and teaching aids that are visible to learners.

- **Emotional environment:**
  - You need to be firm yet warm and pleasant. As a teacher you must set the right tone, telling your learners what behaviour you expect from them.

- **Grouping:**

- You may group your learners according to needs, abilities, and problems but never by sex. Encourage them to share ideas in groups.

- **Class control and discipline:**

- You must be knowledgeable of the school policy on discipline. A teacher must always be firm but fair. Good behaviour must be acknowledged and punishments must be corrective not cruel. You should create an atmosphere of trust and honesty in your class and aim for intrinsic discipline.

- **Motivation:**

- As a teacher you must make your learners feel important through recognizing and rewarding achievements, as encouraging those who are lagging behind. Calling pupils by their names creates good rapport with your class. You should also be a role model to your learners by the way you handle yourself.

- Supervision:
  - You must check learners' work in order to guide and correct them in all areas from group discussions, games, field trips and even homework.

PAPER	TYPE OF PAPER	DURATION	WEIGHTING
1	Multiple choice	1 hour	10
2	Structured	2 hours	30
3	Practical test	3 hours	40
4	SBA (School basea assessment)	Coursework	10
5	Project	Project	10
TOTAL			**100%**

Advanced Level Assessment

PAPER	FORM OF ASSESSMENT	TYPE OF PAPER	DURATION	TOTAL MARKS	WEIGHTING %
1	summative	Free response	3 hours	100	30
2	Assessment	Practical	3 hours	100	40
3	Continous	Coursework	5 items	100	10
4	Assessment	Project	4 items	100	20
TOTAL				**400**	**100**

UNIT 6

SYLLABUS TOPICS

Brunner's Spiral approach will be adopted where the same topics are taught at every level Form One to Four but gaining in breadth and depth as one goes up the ladder. As reflected in the Scope and Sequence Chart, the same topics are covered at each level but the difference is in breadth and content coverage. The level of complexity increases as the learner progresses from one level to the other.

The following topics are to be covered from Form 1 to 4

6.1 Hardware and Software
6.2 Application of Computer Science
6.3 Data Representation
6.4 Communication Networks and Internet technologies
6.5 Security and Ethics
6.6 Systems Analysis and Design
6.7 Algorithm Design and Problem Solving
6.8 Programming
6.9 Databases
6.10 Web Design
6.11 Technopreneurship

The following topics are to be covered from Form 5 to 6

5.1 Data Representation
5.2 Networking
5.3 Computer Architecture
5.4 Security and Ethics
5.5 System Development Life Cycle (SDLC)
5.6 Algorithm Design and Data Structures
5.7 Programming
5.8 Databases
5.9 Enterprising

SCOPE AND SEQUENCE CHART
Ordinary Level

TOPIC	FORM 1	FORM 2	FORM 3	FORM 4
Hardware and Software	Input devices Output devices Storage devices Processing devices Software concepts	Application software System software	Hardware devices Operating systems	Hardware and software maintenance
Application of Computer Science	Agriculture Banking systems Education Social networks Research and development	Agriculture Transport management Health Environmental management Robotics	Agriculture Computer aided manufac- turing Intelligent systems Wildlife management Mining	Agriculture Ambient systems Geographic Information System
Data Representation	Binary Number System Data representation using binary	Conversion denary to binary binary to denary Binary Operations 4 addition and subtraction	Units of storage Number bases	Logic gates Truth tables
Communication Networks and Internet Technologies	Networking Concepts Types of networks Network Topologies Internet services	Data transmission modes Data transmission media Types of Networks Internet Service Providers	Mobile technology Cloud Services	Network protocols Networking Devices
Security and Ethics (Unhui/ Ubuntuf/Vumunhu	Cyber-wellness (Unhu/ Ubuntu/ Vumunhu) Copyright issues Plagiarism and piracy	Computer Crime Data protection measures Computer Ethics	Privacy and Data Integrity System security Cybercrime	Data backup Disaster recovery plan

TOPIC	FORM 1	FORM 2	FORM 3	FORM 4
System Analysis and Design	Systems development life cycle Problem identification	Feasibility study	Systems Analysis Systems Design Development & Testing	Documentation User Training Implementation, Evaluation and Maintenance
Algorithm Design and Problem-solving	Introduction to Algorithm Tools Sequence Construct	Algorithm Tools	Algorithm Tools Interpreting and Testing Algorithms	Algorithm Design
Programming	Programming Concepts	Programming Concepts Functions Testing and Debugging	Interface design Interface design Visual Programming Testing and Debugging Errors	Coding programs Testing and Debugging
Databases	Database Creation File structure elements Database objects and views	Database objects and views Data manipulation methods Data analysis Database security	Database objects and views External data sources Database security	Advanced Queries Database connection Database security
Web design	Web page templates Web content development	Content management systems (CMS) Web site templates Web Content Development Testing and Debugging Plugins and Extensions	CMS Graphic design Ads Web Security Plugins/Extensions	Web development Web Security Testing and Debugging
Technopreneurship	Elements of Intellectual Capital Business Ethics (Unhu/ UbuntuNumunhu) Marketing and business strategies	Environmental technopreneurship components Technology innovation and design thinking	Laws and policies on tech- nopreneurship Intellectual Property Rights	Finance and funding Market research

Advanced level

TOPIC	FORM 5	FORM 6
7.1 Data Representation	• Number bases • Floating point arithmetic • Computer arithmetic errors • Data representation	
7.2 Computer Architecture	• Hardware Architecture	• Software Architecture
7.3 Networking	• Open Systems Interconnection (CSI) Model • Transmission Control Protocol (TCP)/Intemet Protocol(IP) • IP Addressing • Domain Name Systems • Routing Protocols	• Cloud Services Models • Cloud Types Model
7.4 Systems Development Life Cycle (SDLC)	• Systems Development Life Cycle (SDLC- Waterfal Model)	• Object Oriented Methodology • Prototyping
7.5 Security and Ethics	• Data privacy and Integrity • Common threats and software vulnerabilities to computer systems • Protection, access control, and authentication • Legislation on computer security and crimes • Disaster Recovery methods • Risk Management techniques • Code of ethics at the workplace • Business ethics • Impact of social media	• Security Policies • Laws and Computer Crime • Environmental laws and issues • Impact of social media • Ethical principles
7.6 Algorithm Design and Data	• Pseudocode structures • Standard algorithms • Data structures	• Binary trees and array operations Structures • Primitive data types • Recursion
7.7 Programming	• Programming language features • Structured programming • Functions and procedures • Arrays • File handling • Interface design	• Object Oriented Programming • Advanced Programming

7.8 Databases	• File based database systems • Database Management Systems (DBMS) • Relational Database modeling • Database management	
7.9 Enterprising	• E-Business • Intellectual Property Rights • Application areas of Computer Science • Business Proposal Development	• E-Commerce • Telecommunications • Business and enterprise