ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

COMPUTER SCIENCE SYLLABUS

FORMS 1 - 4

2024 - 2030

Curriculum Development and Technical Services
P. O. Box MP 133
Mount Pleasant
Harare

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- Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (MoHTEISTD)
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1.0 PREAMBLE

1.1 Introduction

The Heritage-based Computer Science syllabus is designed to cover the first four years of Secondary Education in Computer Science. It shall provide essential computer skills for managing information systems.

1.2 Rationale

Computer Science equips learners with creativity and innovative thinking skills necessary for the 21st century digital-economic development. It also fosters in learners knowledge, values and attitudes of the evolving nature of technology, while applying research skills in computer based projects. The syllabus provides a foundation for further studies in specialized areas of computing and equips learners with computer related skills for self-sustenance.

1.3 Summary of Content (Knowledge, Skills and Attitudes)

Computer Science is a learning area which among other content covers Computer Applications, Network technologies, Technopreneurship, Computer Architecture, System Development, Security and ethical computer principles that meet local and global standards.

1.4 Assumptions

It is assumed that learners:

- have had some exposure to ICT tools
- have acquired basic computer literacy skills
- have acquired basic computer operation skills
- have completed the Junior ICT learning area

1.5 Cross- cutting themes

The teaching and learning of Computer Science should integrate the following cross cutting themes:

- Entrepreneurship
- Climate Change
- Health and wellbeing
- Child Rights and Responsibilities
- Gender equity
- Environmental Management
- Disaster Risk Management

2.0 PRESENTATION OF SYLLABUS

The Computer Science syllabus is presented as one document for Forms 1 to 4. It consists of the preamble, aims, objectives, methodology, scope and sequence, competency matrix and assessment.

3.0 AIMS

The syllabus aims to enable learners to:

3.1 appreciate the organisation of computer systems
3.2 demonstrate an understanding of the issues surrounding the development and use of information communication technologies (ICTs)
3.3 develop programming and analysis skills through system development.
3.4 foster a culture of innovative thinking for socio-economic development
3.5 design, develop, and deploy autonomous robotic systems, applying computer science concepts to

solve real-world problems while considering social, ethical, and environmental implications

4.0 SYLLABUS OBJECTIVES

Learners should be able to:

4.1 describe a range of information processing systems
4.2 explain the effects of introducing information processing systems both to individuals and to the organisations
4.3 explain the functions of individual hardware and software components of ICT systems and their Interrelationship
4.4 use computers sensibly to generate, implement and document solutions appropriately
4.5 demonstrate the techniques used to solve real life problems using technology
4.6 analyse ICT applications in terms of data flow and system requirements
4.7 analyse, evaluate, make reasoned judgments and present conclusions using technology
4.8 demonstrate proficiency in the creation, design and implementation of computer solutions using-programming packages
4.9 conduct research using the internet
4.10 design, develop, and deploy autonomous robotic systems, applying computer science concepts to solve real-world problems while considering social, ethical, and environmental implications.

5.0 METHODOLOGY ANDTIME ALLOCATION

5.1 Methodology

The teaching and learning of Heritage-based Computer Science is based on a learner-centred approach. The following methods are recommended:

- Problem solving
- E-learning
- Multi-media
- Simulation and modeling
- Discovery
- Experimentation
- Design based learning
- Project-based learning
- Question and answer
- Demonstrations
- Discussion
- Educational Tours
- Research and Presentations
- Expert guest presentations

Time Allocation

The subject should be allocated at least 6 periods of 40 minutes per week. Two of the periods should be devoted to theory and four of the periods to practical work.

6.0 TOPICS

The syllabus consists of the following topics:

6.1 Hardware and Software Computer components
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

7.0 SCOPE AND SEQUENCE CHART

TOPIC	FORM 1	FORM 2	FORM 3	FORM 4
Hardware and Software Computer components	• 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 manufacturing • 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 • 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 (Unhu/ Ubuntu/ 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/ Ubuntu/Vumunhu) • Marketing and business strategies	• Environmental technopreneurship components • Technology innovation and design thinking	• Laws and policies on technopreneurship • Intellectual Property Rights	• Finance and funding • Market research

8.0 COMPETENCY MATRIX

FORM 1

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.1 Hardware and software	• explain how hardware devices work • connect hardware devices • identify types of software	• Input devices • Output devices • Storage devices • Processing devices • Software concepts	• Identifying hardware devices • Connecting and troubleshooting hardware devices • Classifying types of Software • Conducting educational tours to technology centers	• PCs and Laptops • Printers • Multimedia tutorials
8.2 Application of Computer Science	• describe areas of computer applications	• Agriculture • Banking systems • Education • Social networks • Research and Development	• Distinguishing different computer applications • Conducting educational tours to business organisations	• Internet • Print media • Multimedia Tutorials
8.3 Data Representation	• outline the concept of binary number system • recognize the use and importance of binary numbers in computer system	• Binary Number System • Data representation using binary	• Using logic circuits to represent binary number system • Discussing binary number system	• Print Media • Internet • Calculators • Circuit boards

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.4 Communication Networks and Internet Technologies	• outline the concept of computer networks • describe network topologies • use Internet services	• Networking Concepts • Types of Networks - LAN - WAN • Network topologies - Star - Ring - Bus - Mesh • Internet services - Email - E-commerce - E-learning - Social media	• Defining network terms • Illustrating network topologies • Discussing internet services • Utilising Internet services • Conducting educational tours to Internet service providers	• Print media • Multimedia tutorials • Internet
8.5 Security and Ethics (Unhu/Ubuntu/ Vumunhu)	• outline the characteristics of cyber culture and its impact • describe the characteristics of safe and unsafe sites • suggest effects of online content and behaviour • explain the importance of copyrights • describe consequences of plagiarism and piracy	• Cyber wellness - Cyber use - Handling online content and behavior - Online relationship • Copyright issues • Plagiarism and piracy	• Discussing on cyber use and culture • Checking for safety of websites • Blocking unsafe websites • Discussing social impact of online content and behaviours • Carrying out campaigns on online relationships • Discussing the copyrights act • Case studies on copyrights is- sues • Researching and reporting on consequences of plagiarism and piracy • Using anti plagiarism software to check for plagiarism in a document	• Internet • Zulu URL Risk Analyzer • Comodo Web Inspector • Multimedia tutorials • Guest experts • Copyright Act (Chapter 26:1) • Anti-plagiarism software such as Turn- it- in, Viper, See Sowles

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.6 System Analysis and Design	• outline the stages in the systems development life cycle (SDLC) • identify problems of the existing system	• Systems Development Life Cycle Overview - Generic Model • Problem identification - Preliminary investigation • Data collection techniques (Questionnaire, Interview, Record inspection, Observation)	• Discussing the stages involved in system development • Stating the activities under problem identification • Conducting case studies on problem identification	• Print media • Multimedia tutorials
8.7 Algorithm Design and Problem-solving	• define an algorithm • explain the purpose of algorithms • explain sequence construct • apply the sequence algorithm structure	• Algorithm Tools Introduction • Sequence Construct	• Giving examples of algorithms • Discussing sequence construct • Interpreting a sequence algorithm • Solving problems using a sequence algorithm structure • Dry running a sequence algorithm	• Multimedia tutorials • Print media puzzles • Puzzles
8.8 Programming Concepts	• explain the syntax and semantics of the programming language • declare variables and constants • apply operators to solve problems	• Programming Concepts - Program structure - Variables and constants - Data types: integer, character, string and boolean - Operators o Arithmetic o Logical o Relational	• Discussing the syntax and semantics of the programming language • Using variables and constants in a program • Solving basic mathematical problems • Testing and debugging	• Case studies • Software development tools such as Python, VB.Net, Java

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.9 Databases	• create a database • create a file structure • design forms, reports and queries	• Database creation • File structure elements - Fields - Data types - Field size - Data formats - Validation rules and input masks • Database objects and views - Queries - Forms • Reports	• Developing a database • Setting fields, data types, for- mats, field sizes, validation checks and input masks • Comparing database models • Performing CRUD (Create, Retrieve, Update, Delete) operations on a table • Creating forms • Designing queries • Running queries • Designing reports	• Database packages such as MS Access, MySQL
8.10 Web design	• navigate a webpage • customize web pages • use webpage templates to create web pages • generate web content	• Webpage elements • Web page templates • Web content development	• Navigating a chosen webpage • Modifying existing web pages • Designing web pages using templates • Creating and uploading web page content	• Web development tools such as Joomla, WordPress, MS Front Page, Note- pad++ • Web Browsers such as Firefox
8.11 Technopreneurship	• describe the elements of intellectual capital • explain the attributes of business ethics • identify the marketing and business strategies elements • explain the elements of marketing and business	• Elements of Intellectual capital - Human capital - Organisation capital - Social capital • Business ethics (Unhu/Ubuntu/ Vumunhu) • Marketing and business strategies - e-commerce	• Discussing the elements of intellectual capital • Discussing the attributes of business ethics • Creating an ICT based business plan • Discussing the elements of marketing and business strategies	• Internet • Print and electronic media such as journals • Case study • CZI organization

FORM 2

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.12 Hardware and software	ntify types of application ware utility software and tools	• Application software • Off shelf software - Customized software - Open-source software • System software Utility tools	• Discussing types of application software • Classifying of application soft- ware • Performing system optimisation	• Operating systems such as Linux, Windows, MAC OS • System utility tools such as Tuneup, Disk Defragmenter
8.13 Application of Computer Science	• describe areas of computer applications	• Agriculture • Transport management • Health • Environmental management • Robotics	• Discussing different computer application areas • Conducting educational tours to business organizations	• Internet • GIS (Geographic Information system) • Print media • Health information systems
8.14 Data Representation	• convert numbers from one base to another • convert keyboard char- acters to ASCII code • add binary numbers • subtract binary numbers	• Conversion of binary to denary and vice versa • Addition of binary numbers • Subtraction of binary numbers	• Converting numbers from one base to another • Converting keyboard char- acters to binary numbers using ASCII character codes • Adding and subtracting binary numbers	• ASCII Character Codes chart • Internet • Scientific calculator

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.15 Communication Net- works and Internet Technologies	• describe data transmission modes • explain characteristics of transmission media • outline types of networks • explain services offered by internet service providers	• Data transmission modes - Duplex/full duplex - Half duplex - Simplex • Data Transmission Media - Twisted pair - Coaxial - Optic fibre - Wireless - Common media characteristics (Costs, Noise immunity, Size and scalability) • Types of networks - LAN - WAN - PAN - MAN • Internet Service Providers (ISP)	• Experimenting on data transmission modes and tabulating results • Comparing the characteristics of transmission media • Drawing network types • Modelling types of networks • Conducting educational tours to network service providers	• Internet • Switches • Routers • Cables • Computers • Networking toolkit
8.16 Security and Ethics (Unhu/Ubuntu/ Vumunhu)	• explain computer crime and its effects • apply data protection measures • explain the ethical issues that can arise from online activities	• Computer crime • Data protection measures - Passwords - File permissions modes • Computer Ethics	• Discussing computer crime and its effects • Applying data protection measures • Discussing the impact of unethical practices	• Anti-malware / anti-virus software • Encryption software such as Bit Locker • Application packages such as Nitro • Internet • Multimedia tutorials • Social Networks

8.17 System Analysis and Design	• explain areas of feasibility • carry out a feasibility study	• Feasibility study - Technical - Economic - Legal - Operational • Social	• Discussing the different areas of feasibility • Conducting a feasibility study	• Research Instruments • Case Study • SDLC chart

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.18 Algorithm Design and Problem-solving	• Explain selection and repetition constructs • apply selection and repetition algorithm structures in problem solving	• Algorithm Tools - Pseudo code structures - Selection and repetition	• Discussing selection and repetition constructs • Interpreting selection and repetition algorithms • Solving problems using selection and repetition algorithm structures • Dry running algorithms	• Algorithm charts • Multimedia tutorials
8.19 Programming	• develop programs that use pseudo code structures • develop a program using functions • test and debug programs	• Programming concepts - Control structures o Repetition/iteration/loop o Selection • Functions • Testing and Debugging	• writing programs that use pseudo code structures • Applying functions in solving problems • Testing and debugging	• Programming tools such as VB.Net and Python • Multimedia tutorials
8.20 Databases	• develop databases using database objects and views • edit database objects • apply database security controls	• Database objects and views - Datasheets - Queries - Forms - Reports • Data manipulation methods • Database security	• Creating a database • Performing database operations; Create, Read, Update and Delete (CRUD) • Searching and filtering records • Sorting records • Generating reports • Applying database security measures	• Database packages such as MS Access, MySQL • Multimedia tutorials • Expert Guests such as Database Administrator

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.21 Web design	• use Content Manage- ment System (CMS) tem- plates to create websites • customize Websites • generate content using Graphics design pack- age • apply the concept of debugging and testing • use Plugins and extensions in web development	• CMS Web site templates - HTML • Web content development • Testing and Debugging • Plugins and Extensions	• Designing websites using CMS web templates • Creating and uploading website content • Testing and debugging • Applying plugins and extensions	• Graphics Software packages such as GIMP, Windows Picture Manager • Web development tools such as Joomla, Notepad++ • Web Browsers
8.22 Technopreneurship	• describe the technoprneurship components	• Environmental technopreneurship components - Science parks - Incubation centres - Academic institutions - Research and development centres	• Discussing the uses of technopreneurship components • Attending to ICT Exhibition Expos	

FORM 3

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.23 Hardware and Software	• identify the various applications of hardware devices • compare different operating systems • explain the functions of an operating system	• Hardware devices - Applications of hardware devices such as. Point Of Sale Terminal, ATM, Data Capturing System • Operating systems - Personal Computer (PC) Operating Systems - Mobile Operating System; An- droid, Symbian, Windows	• Demonstrating the use of hard- ware devices • Identifying different operating systems • Discussing the functions of an operating system	• Operating systems such as Android, Symbian, Windows • Mobile phones
8.24 Application of Computer Science	• describe areas of computer applications	• Agriculture • Computer aided manufacturing • Intelligent systems • Wildlife management • Mining	• Distinguishing different computer applications • Conducting educational tours to business organizations	• Internet • Print media
8.25 Data Representation	• outline units of storage • convert denary numbers to octal and hexadecimal	• Units of storage - Bit - Nibble - Byte - Kilobyte - Megabyte - Terabyte • Number bases - Octal - Hexadecimal	• Converting of denary to hexadecimal, octal and vice versa	• Print media • Internet • Scientific Calculator

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.26 Communication Networks and Internet Technologies	• identify types of mobile technologies • describe the role of mobile technologies in communication • explain the application of wireless technologies • explain the concept of cloud computing services	• Mobile technology - Mobile phones - Satellite - PDAs - Tablets • Wireless technologies - WiFi, - WiMax, - Blue tooth, - Infrared - Microwave - Radio waves • Cloud services	• Discussing the application of mobile technologies • Discussing the application of wireless technologies • Using cloud services such as uploading and downloading files	• Internet • Cloud services such as Google Drive, One Drive, Drop Box • Mobile devices
8.27 Security and Ethics (Ubuntu/ Unhu/Vumunhu)	• apply data privacy measures • verify and validate data • set up a firewall • apply network security measures • identify online crimes	• Privacy • Data Integrity - Verification - Validation • System security • Cybercrime - Spoofing - Sniffing - Fraud • Hacking	• Creating user accounts with different access levels • Using verification techniques during data capturing • Using validation techniques to validate data such as checksum, format check • Configuring a firewall • Protecting networks using proxy servers • Discussing use of digital signature and certificates • Discussing online crime	• Database package • Validation tools • Multimedia tutorials • Utility tools • Internet

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.28 System Analysis and Design	• describe the activities involved in the analysis stage • apply system analysis on projects • describe the activities involved in the design stage • design input, output and user interface for the project • design file structures and tables • construct system flow charts and pseudo codes • explain activities involved in the development and testing stage	• Systems Analysis - Alternative solutions - Data Flow Diagrams (DFDs) - Activity diagram • Systems Design - Input/ output design - User interface design - Database/ File design - System Flow Charts - Algorithm design • Development & Testing - Coding - Testing	• Explaining the activities involved in systems analysis • Conducting case studies on anal- ysis (on small scale) • Stating the activities in the design phase • Illustrating design tools • Conducting case studies on de- sign stag • Describing the development and testing phase • Designing a testing strategy/plan for a given situation	Design tools • CASE tools • Analysis tools
8.29 Algorithm Design and Problem-Solving	• design flow charts • construct pseudo codes • use top-down approach to represent an algorithm • use trace tables to dry run algorithms • correct errors in an algorithm	• Algorithm Tools - Flow chart - Pseudo code - Top down and bottom-up de- sign • Interpreting and Testing Algorithms	• Creating flow charts • Developing pseudo codes to solve problems • Breaking down problem into sub-problems • Dry running an algorithm • Debugging algorithms	• Algorithm charts • Smart Draw • MS Visio • Trace table

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.30 Programming	• create user interfaces • declare functions use ob- jects in interface design • test and debug programs • identify types of errors • apply error handling techniques in programming	• Interface design • Visual Programming - Functions - Objects • Testing and Debugging • Errors	• Designing menus and sub menus • Using functions in a program • Choosing appropriate objects in interface design • Testing and debugging programs • Discussing types of errors • Using error handling techniques	• Programming packages such as Python, VB, Java • Expert Guests
8.31 Databases	• create relational data- bases • design forms and reports • create queries • import and export data • apply database security	• Database objects and views - Queries - Forms - Reports • External data sources • Database security	• Creating a relational database • Generating forms, queries and reports • Importing and Exporting data • Using database security measures	• Database packages such as Microsoft access, oracle, MySQL
8.32 Web Design	• use Content Management System (CMS) templates to create websites • customize Websites • generate content using Graphic design packages • integrate web security in web designing	• Content management systems - Web feeds - Ads • Graphic design - Animations - Videos • Web security - Cookies - Developer tools - Plugins/Extensions	• Design websites using CMS web templates • Creating and uploading website content • Using graphic design packages in web development • Applying security measures in web designing • Testing and debugging	• CMS such as Word press, Joomla, Drupal • Graphics Design Packages such as Adobe Flash Photo-shop • Web development tools • Browsers • Expert Guests

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.33 Technopreneurship	• identify laws that govern technopreneurship • describe the intellectual properties rights	• Laws and policies on technopreneurship • Intellectual Property Rights - Patents - Copyrights	• Discussing the laws and policies of technopreneurship • Describing the intellectual proper- ty rights	• Internet • Electronic and print media • Expert Guests

FORM 4

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.34 Hardware and Software	• replace malfunctioning components • troubleshoot and fix common software and hardware problems	• Hardware and software maintenance - Common Errors - Software - Keyboard - Mou - Hard drive - Memory	• Maintaining hardware and soft- ware • Building a functional PC	• Hardware components • Software tool kit • Repair toolkit • Internet • Multimedia tutorials
8.35 Application of Computer Science	• design models of Agricultural systems, Ambient systems and Geographic Information Systems	• Agriculture • Ambient systems • Geographic Information System	• Constructing models of given systems	• Hardware components • Software tool kit • Internet • Multimedia tutorials • Expert Guests
8.36 Data Representation	• represent logic gates using symbols • construct truth tables • model electronic circuits using logic gates	• Logic gates • Truth tables	• Drawing logic gates • Constructing truth tables using up to 3 inputs • Modelling logic circuits	• Internet • Circuit boards • Design tool kits

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.37 Communication Networks and Internet Technologies	• explain network proto- cols • explain functions of the networking devices • design a network model • configure a network	• Network protocols - Transmission Control Proto- col/Internet Protocol (TCP/IP) - Open System Interconnection (OSI) • Networking devices - Hub - Router - Switch - Bridge - Modem	• Discussing network protocols • Analyzing network traffic using protocol analyzers • Discussing functions of networking devices • Configuring a network model	• Protocol analyzers such as Wireshark • Networking devices • Network tool kit • Internet
8.38 Security and Ethics (Unhu/Ubuntu/ Vumunhu)	• backup files • formulate a recovery plan • use data recovery tools	• Data Backup • Disaster recovery	• Creating back up files • Creating a recovery plan • Using data recovery tools	• Server/ PC • Cloud services such as Drop box, Google drive, One drive • Secondary storage media • Recovery tools such as Recuva
8.39 System Analysis and Design	• describe the types of documentation and their contents • outline the importance of user training in carrying out a project • describe the activities involved in the implementation, evaluation and maintenance stages	• Documentation • User Training • Implementation, Evaluation and Maintenance	• Listing contents of user and technical documentation • Conducting case studies on documentation and user-training • Discussing implementation methods, evaluation techniques and the need for system maintenance	• Print and electronic media • Project plan template

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.40 Problem-Solving	• design algorithms	• Algorithms Design	• Writing alogarithms for the project	• Project Plan Template • Multimedia Tutorials
8.41 Programming	• develop project code using programming concepts • test and debug programs	• Coding programs • Testing and Debugging	• Writing code for project modules • Testing and debugging project modules	• Print and Electronic media • Programming tools • Internet
8.42 Database	• create queries based on multiple tables • link database to project modules • apply security measures to database	• Advanced Queries • Database connection • Database Security	• Performing database operations • Connecting database to project modules • Applying security measures on databases	• Database packages such as Microsoft Access, Oracle, MySQL
8.43 Web design	develop Websites using web development tools • apply security measures in web development • test and debug a web application	• Web development • Web security • Testing and Debugging	• Designing and developing a website • using security measures in web development • Testing and debugging a web application	• CMS such as WordPress, Joomla, Drupal • Graphic Software such as Adobe Flash, Photoshop • Web development tools • Browsers • Multimedia tutorials

SKILL/TOPIC	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED LEARNING RESOURCES
8.44 Technopreneurship	• outline financial resource components • identify ideal conditions for business location	• Finance and funding • Market research	• Discussing finance and funding opportunities • Discussing ideal conditions for business location • Conducting market surveys	• Print and Electronic media • ICT Tools

9.0 ASSESSMENT

Learners shall be assessed through School Based Continuous Assessment (SBCA) and Summative Assessment (SA). These assessments shall be guided by the principles of inclusivity, practicability, authenticity, transparency, flexibility, validity and reliability. The principles are crucial for creating a supportive and effective learning environment that fosters growth and development in learners. Arrangements, accommodations and modifications shall be visible to enable candidates with special needs to access assessments.

This section covers the assessment objectives, the assessment model, the scheme of assessment, and the specification grid.

9.1 Assessment Objectives

Learners should be able to:

9.1.1 describe a range of information processing systems
9.1.2 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 interrelation- ships
9.1.3 use computers to generate, implement and document solutions appropriately
9.1.4 demonstrate knowledge and understanding of the techniques used to solve real life problems
9.1.5 analyze software programs in terms of data flow and system requirements
9.1.6 analyze, evaluate, make reasoned judgments and present conclusions
9.1.7 develop an understanding of the component parts of computer systems and how they inter-relate
9.1.8 interpret and organize information
9.1.9 recognize and present information in a variety of forms
9.1.10 create computer-based systems following the Systems Development Life Cycle (SDLC) model
9.1.11 conduct research using the internet

9.2 Assessment Model

Assessment of learners shall be both Continuous and Summative as illustrated in Figure 1. School Based Continuous Assessment shall include recorded activities from the School Based Projects done by the learners. The mark shall be included on learners' end of term and year reports. Summative assessment at school level shall include terminal examinations which are at the end of the term and year.

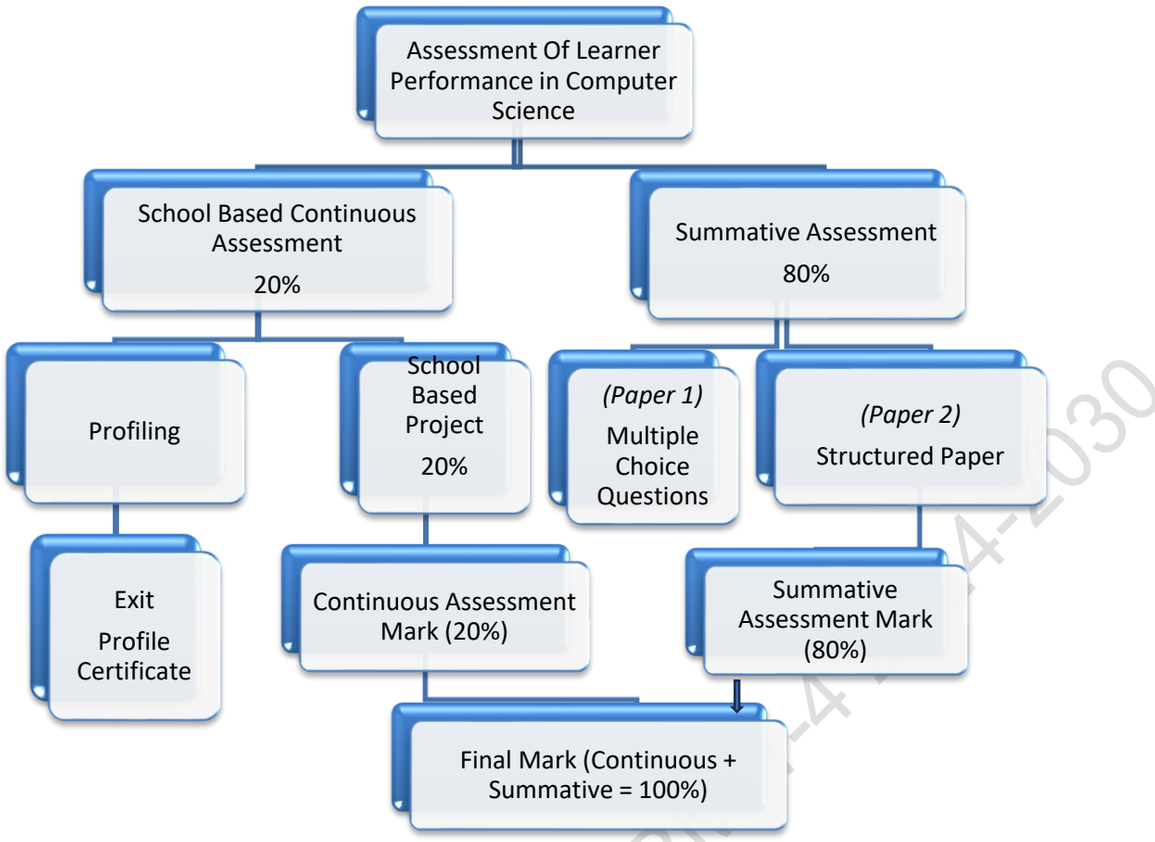


Fig. 1 Assessment Model

In addition, learners shall be profiled and learner profile records established. Learner profile certificates shall be issued for checkpoints assessment in schools as per the dictates of the Teacher's Guide to Learning and Assessment. The aspects to be profiled shall include learner's prior knowledge, values and skills, and subsequently the new competences acquired at any given point.

9.3 Scheme of Assessment

The Assessment Model shows that learners shall be assessed using both School Based Continuous Assessment and Summative Assessment for both School and ZIMSEC assessments.

The table shows the Scheme of Assessment where 20% is allocated to School Based Continuous Assessment and 80% to School or ZIMSEC Summative Assessment.

FORM OF ASSESSMENT	WEIGHTING
School Based Continuous Assessment	**20%**
Summative Assessment	**80%**
Total	**100%**

9.3.1 Description of School Based Continuous Assessment

Learners shall do one school-based project per form which contributes to 20% of the end of year final mark. The end of year summative assessment shall then contribute 80%. However, for ZIMSEC public examinations, two (2) school-based projects shall be considered as School Based Continuous Assessment at Form 6. The two School Based Projects shall include those done during Form 3 and 4 sessions. Each will contribute 10%.

9.3.1.1: School – Based Project Continuous Assessment Scheme

The Table given below shows the Learning and Assessment Scheme for the School Based Project.

Project Execution Stages	Description	Timelines	Marks
1	Problem Identification	January	5
2	Investigation of related ideas to the problem/innovation	February	10
3	Generation of possible solutions	March	10
4	Selecting the most suitable solution	April-May	5
5	Refinement of selected solution	June	5
6	Presentation of the final solution	July	10
7	Evaluation of the solution and Recommendations	August-September	5
	TOTAL		50

9.3.2 Description of the ZIMSEC Summative Assessment

ZIMSEC Summative Assessment shall be a public examination at Form 4. The examination shall consist of three (3) papers of different weighting.

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.

Paper	Type of Paper	Duration	Weighting
1	Multiple Choice	1 hour	10
2	Structured	2 hours	30
3	Practical Test	3 hours	40
Total			80%

9.2 Specification Grid

(i) Content distribution

PAPER 1

TOPIC	WEIGHTING (%)
Hardware and Software	10
Application of Computer Science	10
Data Representation	10
Communication Networks and Internet Technologies	10
Security and Ethics (Unhu /Ubuntu)	10
System Analysis and Design	10
Algorithm Design and Problem-solving	10
Programming	10
Databases	10
Web Design	5
Technopreneurship	5
TOTAL	100

PAPER 2

SECTION	WEIGHTING (%)
Hardware and Software	10
Application of Computer Science	10
Data Representation	10
Communication Networks and Internet Technologies	15
Security and Ethics (Unhu/Ubuntu)	10
System Analysis and Design	10
Algorithm Design and Problem-solving	10
Programming	5
Database	5
Web Design	5
Databases	10
TOTAL	100

PAPER 3 Option A

SECTION	WEIGHTING (%)
Programming	50
Databases	30
Web Designing	20
TOTAL	100

PAPER 3 Option B

SECTION	WEIGHTING (%)
Hardware and Software	30
Data Representation	10
Communication Networks and Internet Technologies	50
Technopreneurship	10
TOTAL	100

NB: The Paper is 100% practical skills

PAPER 4 (Continuous Assessment)

Item	Form 1			Form 2			Form 3			Form 4			Totals
Terms	1	2	3	4	5	6	7	8	9	10	11	12	
Theory Assignments	-	1	1	1	1	1	1	1	1	1	1	-	10
Tests	-	1	1	1	1	1	1	1	1	1	1	-	10
Practical Assignments	-	-	-	-	-	-	1	1	1	1	1	-	5
TOTAL	-	2	2	2	2	2	3	3	3	3	3	-	25

NB: Continuous assessment will be made up of 10 assignments, 10 tests and 5 practical assignments. These will be covered in a period of 4 years. All assignments and tests will be marked out of 100

(ii) Skills distribution

All internal and external theoretical assessments shall be 40% knowledge and understanding plus 60% problem solving.
All internal and external practical assessments shall be 100% practical skills.

9.3 Grade Descriptors

The scheme of assessment is intended to encourage positive achievement by all learners. Grade descriptors are therefore provided for pass grades A, B and C to give a general indication of the standards of achievement expected of learners awarded particular grades. The descriptors must be interpreted in relation to the content specified by the Computer Science syllabus but are not designed to define that content. The grade awarded will depend in practice on the extent to which the learner has met the overall assessment objectives.

Grade	Descriptor
A	1. Manage files proficiently including sorting, searching and folder creation. 2. Formulate appropriate solutions to identified problems using Visual Basic and Database 3. Demonstrate an ability to analyze a problem, identify and define the computing requirements ap- propriate to its solution. 4. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices. 5. Demonstrate a thorough understanding of the contents and use of system documentation 6. Demonstrate an in depth understanding of the use of computers in communication and the role played by networks in enhancing communication. 7. An ability to apply design and development principles in the construction of software systems of varying complexity. 8. Analyze all the stages of systems development life cycle and evaluate situations and come up with distinguished solutions using system development tools. 9. Evaluate situations and come up with distinguished solutions using system development tools. 10. Present the usability code with annotations, comments and error handling techniques. 11. An understanding of professional, ethical, legal, security and social issues. 12. Apply ERDs to solve given problems and interpret the ERDs inclusive of cardinalities in the de- scription 13. Use characteristics of VB programming in the code (inheritance, polymorphism and encapsulation). 14. Solve problems using logic gates. 15. Use algorithms to solve problems..

Grade	Descriptor
B	1. Formulate solutions to identified problems. 2. Analyze a given problem solution. 3. Understand the contents and use of system documentation. 4. Demonstrate an understanding of the use of computers in communication and the role played by networks in enhancing communication. 5. Explain all the stages of systems development life cycle. 6. Show an understanding of professional, ethical, legal, security and social issues. 7. Assess situations and come up with solutions using system development tools. 8. Draw and label ERDs and explain the flow of data in the system. 9. Calculate binary numbers. 10. Explain characteristics of VB (inheritance, polymorphism and encapsulation). 11. Code but without the element of error handling. 12. Explain searching and sorting techniques. 13. Draw and interpret logic gates. 14. Write and dry run algorithms
C	1. Explain situations using system development tools. 2. Draw and label ERDs to solve given problems. 3. Convert binary numbers. 4. Distinguish between static and dynamic data structures. 5. State characteristics of VB (inheritance, polymorphism and encapsulation). 6. Code but with some bugs (errors) in the code. 7. Identify searching and sorting techniques. 8. Draw logic gates. 9. Dry run algorithms. 10. Understand the basic use of computers in communication and the role played by networks in en- hancing communication. 11. Understand networking configuration. 12. List all the stages of systems development life cycle. 13. Show an understanding of professional, ethical, legal, security and social issues

9.4 Paper Descriptions

Paper 1: Theory (40 Marks)
The paper consists of 40 compulsory multiple-choice items.

Paper 2: Theory (100 Marks)
The paper consists of 10 – 12 structured questions and the candidates are required to answer ALL questions in spaces provided.

Paper 3 Option A: Practical Exam (100 marks)
The paper comprises practical questions on Databases, Web Design and Programming.

Paper 3 Option B: Practical Exam (100 marks)
The paper comprises practical questions on Hardware and Software, Data Representation, Communication and
Internet Technologies and Technopreneurship. Prerelease material will be published before the end of term 1 form 4.

Paper 4: School Based Assessment (Coursework - 100 %)
Coursework is made up of 10 Assignments, 10 Tests and 5 Practical Assignments set, marked and recorded internally by the teachers. The internal tests are spaced equitably from the beginning of term two in Form One up to the end of term two in Form Four. The tests shall be marked out of 100 Marks. Each test and the marking guidance used shall be filed together with the record of marks. These will be sent to ZIMSEC together with the project file.

Paper 5: Project work (100%)

Pre-release materials will be made available to examination Centres at the beginning of Term One of Form Four. Examination Centres are advised to encourage their candidates to develop solutions to tasks using a high-level programming language, such as Visual Basic or Python. The purpose of the pre-release material tasks is to direct candidates to some of the topics which will be examined in Paper 5. The exam questions will require candidates to have practical programming experience including writing their own programs, executing (running), testing and debugging them. Knowledge of programming language syntax will not be examined in this project report. The higher ability candidates are to be encouraged to extend their practical programming beyond the scope of these tasks.

10.0 GLOSSARY/ APPENDICES

APPENDIX I: GLOSSARY OF TERMS

It is hoped that the glossary will be helpful to learners as a guide. The glossary has been deliberately kept brief not only with respect to the number of terms included but also to the descriptions of their meanings. Learners should appreciate that the meaning of a term must depend in part on its context.

Define	is intended literally for only a formal statement or equivalent paraphrases being required.
State	implies a concise answer with little or no supporting argument e.g. numerical answer that can readily be obtained by inspection.
List	requires a number of points generally each of one word with no elaboration, where a number of points is specified this should not be exceeded.
Explain	may imply reasoning or some reference to theory depending on the context.
Describe	requires the candidate to state in words (using diagrams where appropriate) the main points of the concept.
Outline	implies brevity that is restricting the answer to given essentials.
Predict/deduce	the candidate is expected to produce the expected answer by making a logical connection between other pieces of information.
Suggest	it is used in two main contexts that is either to imply that there is no unique answer or to imply that learners are expected to apply their general knowledge.
Find	is a general term that may alternatively be interpreted as calculate, measure, determine etc.
Determine	often implies that the quantity concerned cannot be measured directly but is obtained by calculation.

APPENDIX II: ACRONYMS

ASCII	American Standard Code for Information Interchange
ATM	Automated Teller Machine
CMS	Content Management System
CRUD	Create, Retrieve, Update, Delete
CZI	Consumer Council in Zimbabwe
DFD	Data Flow Diagram
HTML	Hyper Text Markup Language
ICT	Information and Communication Technology
Internet	International Network
ISP	Internet Service Provider
LAN	Local Area Network
MAN	Metropolitan Area Network
OSI	Open System Interconnection
PAN	Personal Area Network
PC	Personal Computer
PDA	Personal Digital Assistant
SDLC	Systems Development Life Cycle
TCP/IP	Transmission Control Protocol/ Internet Protocol
URL	Uniform Resource Locator
WAN	Wide Area Network
WiFi	Wireless Fidelity
WiMax	World Wide Interoperability for Microwave Access

APPENDIX III: PRACTICAL ASSESSMENT GUIDELINES

Computer Science is a practical subject and a range of practical exercises should complement the study of the practical parts of the syllabus. It is recommended that learners should be exposed to four practical lessons per week. It is also recommended that the maximum computer-pupil ratio be 1:2. In cases where computers are inadequate, teachers are encouraged to group the learners into manageable group sizes. Where possible, machines should be loaded with integrated packages to facilitate easy importing and exporting of documents.

Practical Examination

The practical examination session should be invigilated by the Computer Science teacher(s) and another from any department. The Computer Science teacher is meant to support learners ONLY in terms of software and hardware challenges during the examination. The practical examination is marked by the Computer Science teacher at the school. The marks are submitted to ZIMSEC at a prescribed time for moderation. ZIMSEC will monitor the administra- tion of the practical examination at sampled schools.

Practical Project

Candidates are expected to carry out pieces of work using database package and programming languages. During Form 4 Terms 1, 2 and 3, the candidates must develop an application using a high level programming language from a given scenario based on a relational database. The piece of work must be dated and contain school and candidate details. The pieces of work must be filed in a flat file containing not more than 40 pages. The file MUST be marked by the teacher. The files and the practical examination marks must be submitted to ZIMSEC together with scripts for Paper 2 through the normal packaging and channel.

APPENDIX IV: RESOURCES AND EQUIPMENT

Infrastructure and Equipment

For a school to run the Computer Science Syllabus for examination purposes, the under listed infrastructure and equipment need to be in place

Computer Laboratory

Personal Computers to accommodate at most 2 students per
computer A printer
Computer Desks and Chairs to accommodate the number of students
Dustless Displays for the Teacher (securely-mounted Whiteboard, LCD projector)
Computer Repair
Toolkit Back-up
generator

Theory Classroom

Classroom furniture to accommodate the students
Writing Surface for the Teacher (e.g. securely-mounted Whiteboard, LCD projector)

In both the above cases, there should be adequate lighting and ventilation.

NB: Networked computers and internet connectivity will be an added advantage

Adequately licensed computer software should be available for training purposes – especially the under-listed:

- Spreadsheet
- Database
- Word-Processing
- Presentation
- Operating System
- Programming Language Software
- Antivirus Software

APPENDIX V: SUGGESTED REFERENCE BOOKS

It should be noted that specifying a limited list of textbooks is difficult as new titles are being availed all the time. Teachers are therefore encouraged to consult other books in order to adequately cover the whole syllabus. However, below is a suggested book list which serves the purpose of being a reference guide.

- British Computer Society (2005), The BCS Glossary ICT and Computer Terms, McMillan, UK
- Brown, G and D Watson (2010), IGCSE ICT, Hodder Education, UK
- Doyle, S. (2011), Information Systems for you 4th Edition, Nelson Thompson, UK
- French, C. S (1996), Data Processing and ICT 5th edition, Thompson, UK
- Lead Better & Wain Wright (2004), IGCSE Computer Studies and IT, Cambridge University Press, UK
- Nowel Kalicharan (1998), An Introduction to Computer Studies, Cambridge University Press, UK
- Roderick, T & Rushbrook, G (2002), ICT for GCSE, Oxford University Press, UK
- Taylor, G. (1991), GCSE Computer Studies and Information Technology, McMillan, UK

9.0 ASSESSMENT

The …….. syllabus learning area for ……(~~Grade 3 - 7/Form 1 - 4/5 - 6~~) shall be assessed through School Based Continuous Assessment (SBCA) and Summative Assessment (SA). These assessments shall be guided by the principles of inclusivity, practicability, authenticity, transparency, flexibility, validity and reliability. The principles are crucial for creating a supportive and effective learning environment that fosters growth and development in learners at secondary school level. Arrangements, accommodations and modifications shall be visible to enable candidates with special needs to access assessments.

This section covers the assessment objectives, the assessment model, the scheme of assessment, and the specification grid.

9.1 Assessment Objectives

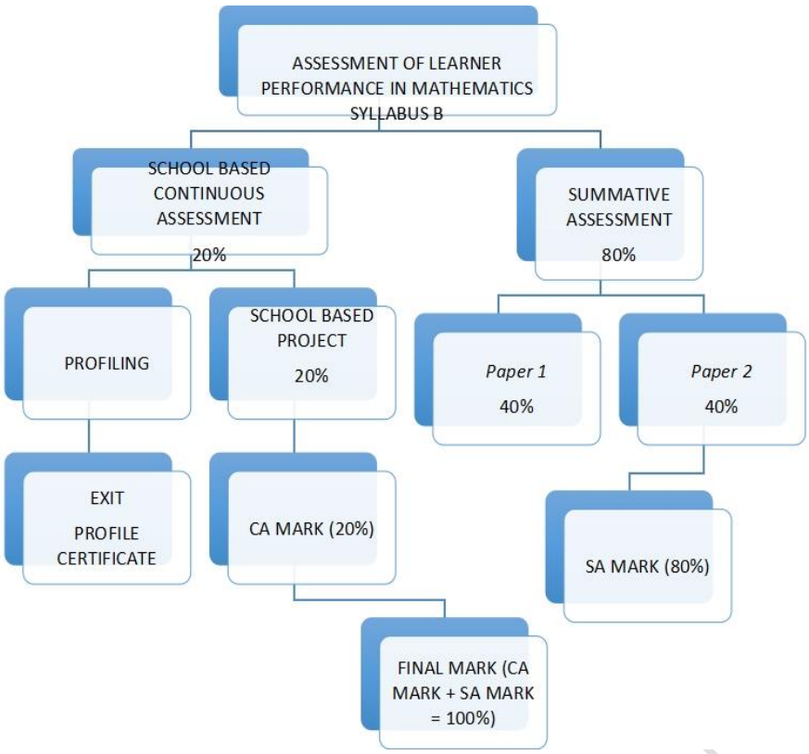
By the end of the …….. syllabus learning area for ……., learners will be assessed on their ability to:

9.1.1
9.1.2
9.1.3

9.2 Assessment Model

Assessment of learners at …….. school level for …… Syllabus shall be both Continuous and Summative. School Based Continuous Assessment shall include recorded activities from the School Based Projects done by the learners. The mark shall be included on learners' end of term and year reports. Summative assessment at school level shall include terminal examinations which are at the end of the term and year.

ASSESSMENT MODEL AT …….. SCHOOL MODULE



In addition, learners shall be profiled and learner profile records established. Learner profile certificates shall be issued for checkpoints assessment in schools as per the dictates of the Teacher's Guide to Learning and Assessment. The aspects to be profiled shall include learner's prior knowledge, values and skills, and subsequently the new competences acquired at any given point.

9.3 Scheme of Assessment

The Assessment Model shows that learners shall be assessed using both School Based Continuous Assessment and Summative Assessment for both School and ZIMSEC assessments.

The table shows the Scheme of Assessment where 20% is allocated to School Based Continuous Assessment and 80% to School or ZIMSEC Summative Assessment.

FORM OF ASSESSMENT	WEIGHTING
School Based Continuous Assessment	**20%**
Summative Assessment	**80%**
Total	**100%**

9.3.1 Description of School Based Continuous Assessment

Learners shall do one school-based project per …… ~~(Grade/Form)~~ which contributes to 20% of the end of year final mark. The end of year summative assessment shall then contribute 80%. However, for ZIMSEC public examinations, two (2) school based projects shall be considered as School Based Continuous Assessment at … ~~(Grade 7/Form 4/6)~~. The two School Based Projects shall include those done during ……..~~(Grade 6/Form 3/5)~~. and … ~~(Grade 7/Form 4/6)~~ sessions. Each will contribute 10%.

9.3.1.1: School – Based Project Continuous Assessment Scheme

The Table given below shows the Assessment Scheme for the School Based Project.

Project Execution Stages from Grade 3 to Form 6	Project Stage Description	Completion Date by end of each stated month below:	Marks
1	Problem Identification	January	5
2	Investigation of related ideas to the problem/innovation	February	10
3	Generation of possible solutions	March	10
4	Selecting the most suitable solution	April-May	5
5	Refinement of selected solution	June	5
6	Presentation of the final solution	July	10
7	Evaluation of the solution and Recommendations	August-September	5
	TOTAL		**50**

9.3.2 Description of the ZIMSEC Summative Assessment

ZIMSEC Summative Assessment shall be a public examination at …….. ~~(Grade 7/Form 4/6)~~. The examination shall consist of …….. papers of equal weighting

Paper	Paper type	Marks	Duration	Weighting
1	…….	…….	……	…….
2	……	…….	…….	……..
3	……..	……..	…….	……..
TOTAL				80%

Paper 1
Duration: ……. hours

……
……

Paper 2
Duration: …… hours
……
……

Specification Grid

Skill	Paper 1	Paper 2
Knowledge and comprehension	50%	50%
Application and Analysis	40%	40%
Problem solving	10%	10%
TOTAL	**100%**	**100%**