Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

NAMIBIA SENIOR SECONDARY CERTIFICATE (NSSC)

COMPUTER STUDIES SYLLABUS

ORDINARY LEVEL

SYLLABUS CODE: 6134

GRADES 10 - 11

FOR FIRST IMPLEMENTATION IN 2019
FOR FIRST EXAMINATION IN 2020

Ministry of Education, Arts and Culture
National Institute for Educational Development (NIED)
Private Bag 2034
Okahandja
Namibia

Computer Studies Syllabus Ordinary Level Grades 10 - 11

ISBN: 978-99916-66-45-7

Printed by NIED

Publication date: 2018

TABLE OF CONTENTS

1. INTRODUCTION

The Namibia Senior Secondary Certificate Ordinary (NSSCO) level is designed as a two-year course for examination after completion of the Junior Secondary phase. The syllabus is designed to meet the requirements of the *National Curriculum for Basic Education (NCBE)* and has been approved by the National Examination, Assessment and Certification Board (NEACB).

The Namibia National Curriculum Guidelines, applicable at the stage of Senior Secondary Education (Grades 10-12) and at equivalent stages of non-formal education, as a part of life-long learning, recognise the uniqueness of the learner and adhere to the philosophy of learner-centred education.

The Namibia National Curriculum Guidelines:

- recognise that learning involves developing values and attitudes as well as knowledge and skills
- promote self-awareness and an understanding of the attitudes, values and beliefs of others in a multilingual and multicultural society
- encourage respect for human rights and freedom of speech
- provide insight and understanding of crucial "global" issues in a rapidly changing world which affects quality of life: the AIDS pandemic, global warming, environmental degradation, distribution of wealth, expanding and increasing conflicts, the technological explosion and increased connectivity
- recognise that as information in its various forms becomes more accessible, learners need to develop higher cognitive skills of analysis, interpretation and evaluation to use information effectively
- seek to challenge and to motivate learners to reach their full potential and to contribute positively to the environment, economy and society

Thus the Namibia National Curriculum Guidelines provide opportunities for developing essential key skills across the various fields of study. Such skills cannot be developed in isolation and they may differ from context to context according to a field of study. The skills marked with an * are relevant to this syllabus.

The skills are:

- communication skills *
- numeracy skills *
- information skills *
- problem-solving skills *
- self-management and competitive skills *
- social and cooperative skills *
- physical skills
- work and study skills *
- critical and creative thinking*

2. RATIONALE

Computer Studies is a dynamic, living and cultural product. It is more than an accumulation of facts, skills and knowledge. The learning of Computer Studies involves conceptual structures, strategies of problem solving and attitudes towards and appreciation of technology. Increasingly in the modern world, acquisition of computer skills is becoming necessary for employment, educational development and leisure. The Computer Studies course intends to furnish students with broad knowledge of the nature of information processing and how Information and Communications Technology (ICT) is used today.

In a fast-growing economic environment, entrepreneurship is a major vehicle for both development and job creation and students will be encouraged to explore how the use of computers can benefit society as a whole. The industrial economy worldwide is driven by ICT, which uses computers to process, analyse and communicate information in an increasingly efficient and effective way. Thus any developing industrial society must have a high level of computer literacy within its workforce who will then be capable of fully exploiting the opportunities made possible by ICT.

The Senior Secondary syllabus for Computer Studies strives to prepare learners to function effectively in the 21st century by providing a basis to utilise the skills and knowledge of computing to:

- acquire a general understanding and perspective of the use of computer systems in order to be productive in a society increasingly dependent on technology
- acquire the necessary skills and knowledge to seek employment in areas that utilise computing
- continue developing their knowledge and understanding of computing for entry into higher education for seeking specialisation in chosen computing field of studies

As a pre-requisite for this course, learners are expected to have passed the subject Computer Studies in the Junior Secondary phase.

3. AIMS

The aims of the syllabus are the same for all learners. These are set out below and describe the educational purposes of a course in Computer Studies Ordinary Level for the NSSC examination. They are not listed in order of priority.

The aims are to enable learners to:

- develop an understanding of the main principles of computing
- develop an understanding of using computer technologies to design and programme user-friendly computer-based solutions of problems
- critically analyse the impact of computer usage on the social, economic, ethical and health sectors
- use information systems to access various resources all over the world for learning purposes
- competently gather, manage and critically interpret information, using appropriate computer technologies
- use computer technologies in creative ways to enhance human interaction
- effectively use computer technologies to:
    - develop problem-solving skills
    - acquire effective communication skills
    - gain knowledge of using technology responsibly
    - develop teamwork skills
    - gain efficiency, precision and accuracy

4. ADDITIONAL INFORMATION

4.1 Guided learning hours

The NSSCO level syllabuses are designed on the assumption that learners have about 130 guided learning hours per subject over the duration of two years, but this is for guidance only. The number of hours required to gain the qualification may vary according to local conditions and the learners' prior experience of the subject. *The National Curriculum for Basic Education (NCBE)* indicates that this subject will be taught for 8 periods of 40 minutes each per 7-day cycle, or 6 periods of 40 minutes each per 5-day cycle, over two years.

4.2 Prior learning

It is required that learners who are beginning this course should have previously studied Computer Studies.

4.3 Progression

NSSCO levels are general qualifications that enable learners to progress either directly to employment, or to proceed to further qualifications. Learners who are awarded grades C to A* in NSSCO are well prepared to follow courses leading to Namibia Senior Secondary Certificate Advanced Subsidiary (NSCCAS) level Computer Science.

4.4 Support materials and approved textbooks

NSSCO syllabuses, question papers, examiner reports and assessment manuals in subjects, where applicable, are sent to all schools. Approved learning support materials are available on the *Senior Secondary Textbook Catalogue for Schools*.

5. LEARNING CONTENT

The learning content outlined below is designed to provide guidance to teachers as to what will be assessed in the overall evaluation of learners. They are not meant to limit, in any way, the teaching programme of any particular school.

The syllabus covers the following **themes**:

Theme 1: System analysis and design
Theme 2: Applications of computers and their social and economic implications
Theme 3: Applications software and data organisation
Theme 4: Problem solution, including algorithm design, programming concepts and logic gates
Theme 5: Hardware, software and communication
Theme 6: Coursework

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 1: SYSTEM ANALYSIS AND DESIGN		
1.1 System analysis	• understand the system life cycle as an iterative process	• define a system life cycle • describe each stage of the system life cycle - analysis - design - development - testing - documentation - implementation and installation - evaluation - maintenance
	• understand the analysis of an application or a situation where problems were encountered within an organisation	• explain why a system has a limited life span • explain the importance of defining a given problem accurately • describe the function of a feasibility study • explain the importance of determining the system requirements in order to solve a problem • describe the following methods of fact finding used to collect information about data flow (data input and output, data processing and storage) together with the associated hardware of the existing system: - questionnaire - structured interviews - observation - study documents used in the existing system • identify the new system requirements • predict the needs for development and maintenance of the new system

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 1: SYSTEM ANALYSIS AND DESIGN (continued)		
1.2 System specification and design	• demonstrate a general understanding of system design to fit requirements	• design a portable system which is independent of particular computer systems • design a system which allows future development to be made without major re-organisation of the system • design the following components: - data input – including data validation - data processing - data output - data storage • design an effective interface – e.g. user-friendly input and output • explain the importance of evaluating the system design against initial specifications
	• understand the specification and the selection of suitable hardware and software for new system configuration	• describe the hardware and software required for the new system based on: - system requirements and task specifications - cost implications - skills level of staff, including training to use the new system • explain the relationship between the system design and the system requirements • develop programs (coding process) that are intended to perform tasks in line with the design specifications • explain the importance of testing and implementation planning

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 1: SYSTEM ANALYSIS AND DESIGN (continued)		
1.2 System specification and design (continued)	• understand the necessity to develop the new system in line with the system design specifications • understand the usefulness of system review and reassessment	• explain the content and importance of documentation of the following system life cycle's components: - technical documentation - user documentation • explain the need to evaluate the results of the new system against initial specified objectives • explain the need to evaluate the results of the new system against initial specified objectives • explain the need of reassessment of the system after a given period to find if it is still performing at the organisation's expectations • explain the usefulness of system maintenance

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS		
2.1 Computer applications **2.1.1 Communication and information systems**	• demonstrate an understanding of the concept of Internet and be familiar with terminology used	• describe services available on the Internet • describe cloud computing • design a webpage (using any application software generating HTML code and forms) similar to what customers expect to see when: - ordering items over the Internet (e-commerce) - searching for information - Internet banking • describe and apply search-engine techniques and features by refining keywords to get desired information (advanced search) • describe the role of the browser • describe the use of an intranet and explain the reasons why it is commonly used by many organisations • explain the differences between the Internet, an intranet and an extranet

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS (continued)		
2.1.1 Communication and information systems (continued)	• demonstrate an understanding of the concept of Internet and be familiar with terminology used (continued)	• describe social media with regard to - communication - collaboration - entertainment - marketing - learning
	• demonstrate an understanding of the use of computer systems for communication and for data processing purposes	• describe the use and the facilities of e-mail • identify the hardware used for video-conferencing • describe the advantages and limitations of video conferencing • describe the use of information retrieval and remote database systems • describe the purpose of multimedia features like sound, animation, graphics and video in the following areas: - education/training sector - marketing - entertainment industry • describe and give examples of the use of computer systems in the increasingly developing e-commerce activities such as: - Internet banking - Internet ordering and payment

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS (continued)		
2.1.1 Communication and information systems (continued)	• demonstrate an understanding of the use of computer systems for communication and for data processing purposes (continued)	• describe wireless technology with regard to: - security aspects - local area network (LAN) - wide area network (WAN) • identify the factors that influence the transmission speed of data on the Internet
2.1.2 General and commercial data processing	• demonstrate an understanding of the use of computers in different areas for data processing purposes	• describe the use of computers for data processing in: - banking - hospital administration - staff records and payroll - stock control
2.1.3 Industrial, technical and scientific uses	• demonstrate knowledge of the use of computer systems in high profile environments like industries and scientific research	• describe the use of computer systems in weather forecasting, focusing on: - methods of gathering and processing data - how information is transmitted - predictions based on new and existing data

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS (continued)		
2.1.3 Industrial, technical and scientific uses (continued)	• demonstrate the knowledge of the use of computer systems in high profile environments like industries and scientific research (continued)	• describe the purpose of computer-aided design (CAD) focusing on the features available within the application such as: - library of ready-made symbols or shapes - modify shapes of an object - test robustness of a design - rotating and viewing an object in 3-dimension • describe simulation and modelling application software explaining: - the need of simulators for training - hardware used as simulators - why modelling is done - how data is gathered for a model - how predictions are made - how to apply a model in a real-life situation • describe the use of virtual reality focusing on - safety purposes in hazardous situations - entertainment - commercial purposes (property market, online shopping) - training
2.1.4 Monitoring and control systems	• demonstrate an understanding of the use of computer systems to monitor and control processes through other devices	• describe monitoring and control systems • describe how the feedback process takes place in a control system • describe the use of computer systems to monitor hospital patients in an intensive care unit such as: - how vital signs are monitored - what triggers the system to activate an alarm

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS (continued)		
2.1.4 Monitoring and control systems (continued)	• demonstrate an understanding of the use of computer systems to monitor and control processes through other devices (continued)	• describe the use of computer systems to regulate traffic control by the use of traffic lights, such as: - how models/simulators are used to set traffic light timing - types of sensors used to gather data - how systems manage timing of lights • discuss the role of computers in modern motor vehicles, such as: - airbag systems - stability control for brake systems - controlling the heat of the car engine - cruise control - active parking assistance - rain and light sensors
2.1.5 Automation and robotics	• demonstrate an understanding of the use of computer systems to automate tasks and control devices	• define nanotechnology • describe the use of nanotechnology in the following areas: - medicine - energy production and conservation - environmental clean-up and protection - nano drones - protective and self-healing materials • explain how computer systems are used in automated and robot equipment such as: - drones - space and sea exploration - production lines • describe, including benefits and limitations, the use of Global Positioning Systems (GPS)

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS (continued)		
2.1.5 Automation and robotics (continued)	• demonstrate an understanding of the use of computer systems to automate tasks and control devices (continued)	• describe the use of voice synthesis for giving directions and give the benefits and limitations • describe the use of robots in industries such as: - their use in car industries or other automated processes - their benefits in terms of quality control and the environment - their impact on the work force • describe the use of closed-circuit television (CCTV) for surveillance purposes, locally and remotely
2.1.6 Expert system	• demonstrate an understanding of the concept of expert systems	• describe an expert system • describe how expert systems are created, including the role of: - the inference engine - the rule base - the knowledge base - human-machine interaction • describe the use of expert systems in: - fault diagnosis (e.g. car engines, electronic devices) - geological surveys - medical diagnosis
2.1.7 Education, training and entertainment	• demonstrate an understanding of using computer systems for the education, training and entertainment sectors	• describe the e-learning concept • describe computer-based learning, such as: - web-based training (WBT) - computer-aided instruction (CAI) - interactive learning and assessment - social learning

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS (continued)		
2.1.7 Education, training and entertainment (continued)	• demonstrate an understanding of using computer systems for the education, training and entertainment sectors (continued)	• describe the use of computer graphics to produce animation material for TV and films, such as: - how cartoons/animation are produced - how special effects are produced and their benefits - how speech and animation are synchronised - superimposing human images into cartoons • describe the use of virtual reality (VR) in: - training medical doctors / pilots / architects - learning to operate complicated machinery, e.g. in military and agriculture sectors - education, e.g. museum tours, astronomy, biology - gaming
2.2 Impacts of the use of computer systems	• demonstrate an understanding of social implications of computer usage	• describe the social advantages and disadvantages of computer use, such as: - access to a wide range of information - increasing productivity - possibility to work remotely (locally or internationally) - de-skilling of employees - retrenchment of employees • discuss the impact of changing trends, e.g. - increase in the preference for mobile devices - the Internet of Things - evolution to Artificial Intelligence (AI) and VR

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS (continued)		
2.2 Impacts of the use of computer systems (continued)	• demonstrate an understanding of the economic implication of computer uses	• describe the impacts, advantages and disadvantages of social media • describe the economic advantages and disadvantages of the use of computers, such as: - decrease in communication cost - Internet business (e-business or e-commerce) - use of new technologies in manufacturing - skilled people needed to sustain the use of new technologies - high cost to acquire new technologies - cost involved in re-training of staff - changes of existing methods and services - changes to the working environment - social media
	• demonstrate an understanding of the environmental implications of computer usage	• describe the effects of - e-waste - social media (e.g. awareness campaigns) - printing indiscriminately
	• demonstrate an understanding of data protection legislation	• describe the need for data protection legislation for personal data

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS (continued)		
2.2 Impacts of the use of computer systems (continued)	• demonstrate an understanding of security and reliability of computer systems	• discuss the consequences of system failure in different areas of applications, such as: - business applications - large mainframe systems • understand the importance of backups • describe the impact of computer crimes such as: - identity theft - fraud - spoofing - invasion of privacy - spam attacks - virus attacks (including ransomware and other malware) - cyber warfare • discuss security issues when using Internet facilities focusing on: - how secure payment features are built-in (encryption) - use of smart card slots in keyboards to allow access people's fear of using the Internet • describe methods of preventing computer crimes such as: - development of complex security code systems - encryption of sensitive and confidential data - audit of access to the computer system (successful and not successful attempts)

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 2: APPLICATIONS OF COMPUTERS AND THEIR SOCIAL AND ECONOMIC IMPLICATIONS (continued)		
2.2 Impacts of the use of computer systems (continued)	• demonstrate an understanding of the need for security measures	• describe various security measures - security tokens - PIN, including OTP and PUK - hardware tokens - software tokens - virtual tokens
	• demonstrate an understanding of the ethical uses of computer systems	• discuss the ethical uses of computer systems such as: - plagiarism - access to controversial information - cyber stalking - cyber bullying - hate speech - sexting

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 3: APPLICATIONS SOFTWARE AND DATA ORGANISATION		
3.1 Software packages		
3.1.1 Application software	• demonstrate an understanding of application software	• define generic software • define integrated software • define specific software • define custom-made software
3.1.2 Spreadsheets	• demonstrate an understanding of major features of spreadsheet (continued from previous phase)	• customise a spreadsheet window • insert/remove toolbars in spreadsheets • create and save new spreadsheet workbook • apply formatting in spreadsheets - align data in cells - rotate text - wrap text - shrink to fit - merge cells - apply a background colour (shading) to a cell • shift between different views in spreadsheets • freeze panes in spreadsheets

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 3: APPLICATIONS SOFTWARE AND DATA ORGANISATION (continued)		
3.1.2 Spreadsheets (continued)	• demonstrate an understanding of major features of spreadsheet (continued)	• use printing options in spreadsheets such as: - print entire workbook - print selected pages - print a worksheet - print only a selected part of a worksheet - scale the worksheet before printing - select a print area - print labels (title rows) on every page - print worksheet in draft quality • use functions in spreadsheets: - statistical functions such as: SUM, AVERAGE, MAX, MIN, COUNT - logical functions such as: IF function - Date functions such as: TODAY( ) and YEAR( ) - VLOOKUP - HLOOKUP - CONCATENATE - ROUND, ROUNDUP and ROUNDDOWN • paste a link, including advanced Paste Special features • use absolute and relative referencing in spreadsheets • apply sorting and filtering functions in spreadsheets • create different types of charts in spreadsheets - bar - pie - column - line

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 3: APPLICATIONS SOFTWARE AND DATA ORGANISATION (continued)		
3.1.3 Database	• understand databases and their purpose	• define the term database • explain the purpose of a database • define the following types of databases: - flat file - relational database • describe the following terms: - table - record - field - primary key - foreign key - database file - relationships • explain the different types of fields • explain the difference between design view, form view, query view and report view
	• demonstrate an understanding of the use of major features of database	• create a database file • create table(s) in a database • change field width in a database • add fields in a database • delete fields from a database • change field types in a database • create relationships between tables in a database

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 3: APPLICATIONS SOFTWARE AND DATA ORGANISATION (continued)		
3.1.3 Database (continued)	• demonstrate an understanding of the use of major features of database (continued)	• enter data in a database file using forms only • create different types of queries in a database such as: - select query - action queries e.g., create table, append, delete, update - parameter query • create forms for a database containing some of the following components: - combo box - list box - sub-form • create forms for a database to perform the following tasks: - data entry only - search and display data only • create reports from a database • create macros to perform the following tasks in a database: - run select and action queries - run forms and reports • apply data migration techniques in a database (import and export) • print retrieved data from a database - form data - query results - reports

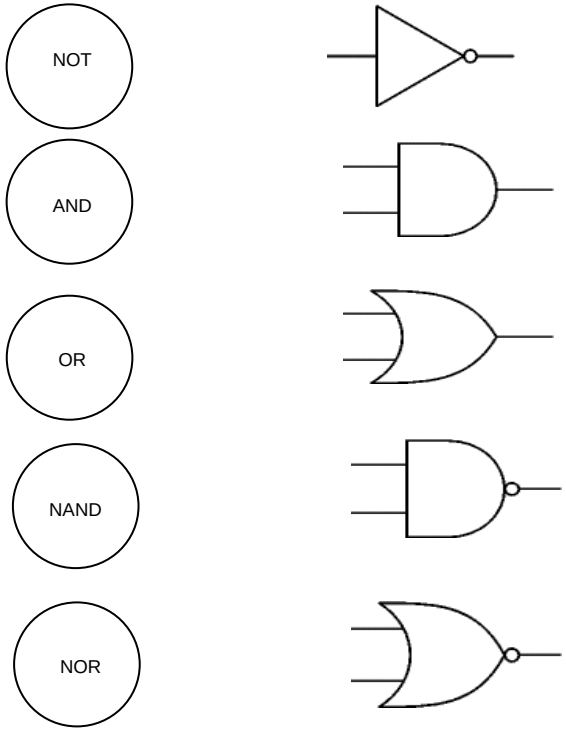
THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 3: APPLICATIONS SOFTWARE AND DATA ORGANISATION (continued)		
3.1.4 Data logging	• demonstrate an understanding of data logging	• describe the concept of data logging • describe the steps, and their associated tools, in data-logging process • describe applications of data logging systems, e.g. in weather forecasting
3.2 Organisation of data	• demonstrate an understanding of the difference between data and information	• explain the relationship between data and information
	• demonstrate an understanding of different types of data collection (automatic and manual)	• discuss different automatic data capture techniques such as: - barcode scanning - Optical Mark Recognition (OMR) - Optical Character Recognition (OCR) - Touch screen - 2D / 3D scanners - QR codes - interactive smart boards - use of sensors - others • describe data capture through external storage media - flash memory - SSD - the cloud

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 3: APPLICATIONS SOFTWARE AND DATA ORGANISATION (continued)		
3.2 Organisation of data (continued)	• demonstrate an understanding of different types of data collection (automatic and manual) (continued)	• describe data validation (using of different validation checks) as method of checking correctness of data on entry: - range check - presence check - character check - format check - length check - type check • describe data verification (double entry or visual check) as method of checking correctness of data on entry

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 4: PROBLEM SOLUTION, INCLUDING ALGORITHM DESIGN, PROGRAMMING CONCEPTS AND LOGIC GATES		
4.1 Data representation	• understand binary data systems	• explain why binary numbers are used in computer systems • convert binary to denary and vice versa using positive values up to 16 bits • explain a byte and how the byte and its function in the measurement of memory • explain what a register is and how binary is used for a variety of applications, e.g. storage, robotics, digital instruments, control systems and programming
	• understand hexadecimal data systems	• convert positive denary values to hexadecimal and vice versa up to 4 hexadecimal digits (integers only) • explain why hexadecimal notation may be the preferred number system • convert binary to hexadecimal and vice versa using positive integers up to 16 bits of binary • explain how hexadecimal numbers are used in - defining colours in HTML (Hypertext Markup Language) - Media Access Control (MAC) addresses - assembly languages and machine code - debugging

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 4: PROBLEM SOLUTION, INCLUDING ALGORITHM DESIGN, PROGRAMMING CONCEPTS AND LOGIC GATES (continued)		
4.1 Data representation (continued)	• understand data paths and the fetch-execute cycle	• explain how data flows through computers, e.g. a storage device; data to a printer; listen to music from the Internet • explain the role of memory in the data path • explain the advantages of buffering, spooling and cache memory • explain the role of interrupts • describe the flow of data in the fetch-decode-execute cycle • identify the following registers and explain their roles in the fetch-execute cycle - Arithmetic and Logic Unit (ALU) - Control Unit (CU) - Memory Buffer Register (MBR) - Memory Address Register (MAR) - Instruction Register (IR) - Memory Data Register (MDR) - Accumulator - I/O Address Register (I/O AR) - Program Counter (PC)

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 4: PROBLEM SOLUTION, INCLUDING ALGORITHM DESIGN, PROGRAMMING CONCEPTS AND LOGIC GATES (continued)		
4.2 Data storage	• understand the need for and principles of a variety of data storage formats	• identify a variety of formats for the storage of audio, video, graphics and alpha-numeric data, such as - Musical Instrument Digital Interface (MIDI) - JPEG - Bitmap - GIF - MP3 and MP4 - PDF (Portable Document Format) - AVI (Audio Video Interleave) - WAV (Waveform Audio) - WMA and WMV (Windows Media Audio and Video) - txt (plain text) - RTF (Rich Text Format) - HTML - ZIP • discuss the verification and correction of data integrity after data transfer processes, e.g. - parity checks - check sums - check digits - Automatic Repeat reQuests (ARQ) • explain how data in different formats (audio, video, graphics and text) can be compressed using lossy or lossless compression

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 4: PROBLEM SOLUTION, INCLUDING ALGORITHM DESIGN, PROGRAMMING CONCEPTS AND LOGIC GATES (continued)		
4.3 Logic gates and circuits	• understand the function of basic logic gates	• recognise the symbols and describe the use of AND, OR, NOT, NAND and NOR and XOR gates • interpret simple logic circuits using a truth table 

<table>
<tr><th>THEMES AND TOPICS</th><th>GENERAL OBJECTIVES
Learners will:</th><th>SPECIFIC OBJECTIVES
Learners should be able to:</th></tr>
<tr><td colspan="3">THEME 4: PROBLEM SOLUTION, INCLUDING ALGORITHM DESIGN, PROGRAMMING CONCEPTS AND LOGIC GATES (continued)</td></tr>
<tr><td>4.3 Logic gates and circuits (continued)</td><td>• understand the function of basic logic gates (continued)</td><td>• produce truth tables for given logic circuits (maximum of 2 inputs and 4 gates)
<table><tr><th>X</th><th>Y</th><th>output</th></tr><tr><td>0</td><td>0</td><td></td></tr><tr><td>0</td><td>1</td><td></td></tr><tr><td>1</td><td>0</td><td></td></tr><tr><td>1</td><td>1</td><td></td></tr></table></td></tr>
<tr><td>4.4 Algorithm design and development</td><td>• design simple logic networks</td><td>• produce a simple logic network from a given statement; e.g. if X AND Y are on then the light will be on</td></tr>
<tr><td></td><td>• develop algorithms based on given problems</td><td>• solve problems in a structured way, using logic and reason
• develop algorithms using algorithm tools such as:
- pseudocode
- flowchart
• design algorithms which relate clearly to the requirements of the system where the problem has been observed
• define the scope of separate modules</td></tr>
</table>

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 4: PROBLEM SOLUTION, INCLUDING ALGORITHM DESIGN, PROGRAMMING CONCEPTS AND LOGIC GATES (continued)		
4.4 Algorithm design and development (continued)	• develop algorithms based on given problems (continued)	• use the following algorithmic constructs of sequence, selection, and repetition to solve problems: - decision structures: ▪ if ... then ... else ... end if or an equivalent ▪ case of ... otherwise ... end case or an equivalent - loops or iteration for conditional and unconditional structures: ▪ while ... do ... end while or an equivalent ▪ repeat ... until or an equivalent ▪ for ... do or an equivalent
		• appropriately apply operators +, -, *, /, MOD and DIV to solve problems
	• understand test strategies to analyse and evaluate algorithms	• select appropriate test data and compare actual test results to expected results
		• use a trace table to dry run an algorithm containing one loop/iteration and at least one decision structure
	• understand errors in given algorithms	• identify where there is an error
		• suggest ways of removing the errors

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 4: PROBLEM SOLUTION, INCLUDING ALGORITHM DESIGN, PROGRAMMING CONCEPTS AND LOGIC GATES (continued)		
4.5 Translate algorithms into computer programs or mobile applications	• understand strategies to select appropriate implementation tools to solve problems	• develop (a) simple program(s)* OR mobile application(s) OR any other solution like macros within a spreadsheet or database • select implementation tools according to the complexity of the problem to be solved. An implementation tool can be one or a combination of the following: - programming language - query language - macro facilities - program (code) generators (these are utilities used to generate codes)
	• understand that algorithms are the design of solutions to problems	• design and implement a graphical user interface (GUI) or any other interface • translate each step of the algorithm into an instruction a computer can understand • describe and apply the following to facilitate the maintenance of programs: - use of comments in program codes - distinguish between variables and constants - meaningful identifier names (variables, constants, programs, functions, etc.) - program indentation
	• understand and use facilities offered by the Interface Development Environment (IDE)	• use the following facilities offered by the IDE: - code editing - debugging tools
	• demonstrate an understanding of the usefulness of functions and procedures	• use built-in functions and procedures available within the application selected

* Although not compulsory, it would be beneficial for an Ordinary level candidate to learn a programming language

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 4: PROBLEM SOLUTION, INCLUDING ALGORITHM DESIGN, PROGRAMMING CONCEPTS AND LOGIC GATES (continued)		
4.5 Translate algorithms into computer programs or mobile applications (continued)	• know how to connect to a database or to a file holding data	• use macros or a query language to apply the following: - add new records - delete records - retrieve records - update records
	• demonstrate an understanding of test strategies to evaluate programs developed	• use test strategies to evaluate programs developed • describe and give examples of the following types of programming errors: - syntax errors (compilation errors) - runtime errors - logic errors • select and apply **suitable** test data for the developed programs

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 5: HARDWARE, SOFTWARE AND COMMUNICATION		
5.1. Types of hardware – Input, output and storage devices	• understand the use of input devices	• describe the principles of operation (how each device works) of these input devices: - keyboards - mice - touch screens - interactive whiteboards - digital cameras - readers (barcode and QR) - scanners (2D and 3D) - microphones • describe how the above functions are used in everyday situations, e.g. - ATMs - scanning of passports at airports - POS systems - touch screens on mobile devices - interactive whiteboards in teaching and training - QR codes in magazines • discuss the use of different types of sensors used for automated input, e.g. in control and monitoring applications - light / laser/ infrared - temperature - magnetic field - gas - pressure - moisture - humidity - oxygen and pH - motion

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 5: HARDWARE, SOFTWARE AND COMMUNICATION (continued)		
5.1. Types of hardware – Input, output and storage devices (continued)	• understand the use of input devices (continued)	• describe the purpose and use of the above sensors in everyday situations, e.g. - street lights - security devices - greenhouses and other environmental monitoring - heating systems - gaming - household appliances - automatic doors - manufacturing and industrial applications
	• understand the use of output devices	• describe how the following output devices work: - printers (inkjet, laser, braille and 3D) - cutters and plotters (2D and 3D) - screens (Liquid Crystal Display (LCD) and Light-Emitting Diodes (LED) display) - projectors (LCD and DLP (Digital Light Processing)) - interactive screens and whiteboards - sound generating devices - actuators in monitoring and control systems • describe how the above functions are used in everyday situations, e.g. - printing (recommend specific printers and/or settings for specific requirements) - use of a variety of screens on a variety of devices - use of projectors and interactive boards - use of actuators in vehicles, e.g. wipers, headlights

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 5: HARDWARE, SOFTWARE AND COMMUNICATION (continued)		
5.1. Types of hardware – Input, output and storage devices (continued)	• understand the use of memory, storage devices and media	• differentiate between types of storage, including examples - primary: Read Only Memory (ROM), and Random Access Memory (RAM) - secondary: hard disk drive (HDD) and Solid State Drive (SSD) - off-line: Digital Versatile Disc (DVD), Compact Disc (CD), Blu-ray disc, USB flash memory and external HDD • explain how the following storage devices work: - magnetic - optical - solid state • describe how the above functions are used for storage solutions, e.g. - HDDs - CDs - DVDs - Blu-ray discs - USB flash memory - SSDs • explain how different storage devices would be suitable for different file formats

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 5: HARDWARE, SOFTWARE AND COMMUNICATION (continued)		
5.2 Characteristics of peripherals used for communication and control systems	• demonstrate an understanding of the use of special peripherals in communication and control systems	• discuss the use of mobile devices for a range of applications such as: - communication - access to the Internet - cameras or webcams - entertainment - diary management - GPS applications - social networking - security - surveillance - exercise equipment - wearable technology
5.3 e-communication	• demonstrate an understanding of the use of devices used to enable computers to communicate (locally and remotely)	• describe the purpose of the hardware used to enable computers to communicate such as: - modems - NIC (Network Interface Cards) – wired and wireless - switches - routers - satellites - wireless devices - USB Wi-Fi adapters - WAPs (wireless access points)

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 5: HARDWARE, SOFTWARE AND COMMUNICATION (continued)		
5.4 Mobile technology	• demonstrate an understanding of current and emerging mobile telecommunications technology	• explain the function and uses of various telecommunications technologies - GSM and GSM applications - 3G, 4G, 5G - H, H+ - E (Edge) - GPRS • explain the uses of the above for various purposes - cell phone banking - mobile apps - entertainment - social media
5.5 Systems and communication	• demonstrate an understanding of operating systems and explain a range of facilities offered by a chosen operating system	• describe the role of an operating system • describe the use of the following operating system facilities: - batch and real-time processing (payroll, online banking, stock control) - multitasking - multi-user - multi-access - screen mirroring - network operating systems (servers) • process-control operating systems • explain different types of interfaces such as: - graphical user interface (GUI) - command line - menu driven

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 5: HARDWARE, SOFTWARE AND COMMUNICATION (continued)		
5.5 Systems and communication (continued)	• demonstrate an understanding of file management	• explain the use of the following operating system tools to manage files: - create, copy, move, delete and rename - organise and display files in directories and sub-directories (folders and sub-folders)
	• demonstrate an understanding of peripheral device control handling	• describe the management and control of peripherals using the following operating system features: - interrupt - polling - spooling - handshaking - buffering
	• demonstrate an understanding of the use of utility software	• explain the purpose of the following types of utility software: - disk formatting - hardware drivers - file compression - disk defragmenters - event viewers - performance viewers - virus checkers

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 5: HARDWARE, SOFTWARE AND COMMUNICATION (continued)		
5.5 Systems and communication (continued)	• demonstrate an understanding of data transfer integrity	• discuss the verification of data integrity after data transfer process using: - check sum - parity check • describe the characteristics of a local area network (LAN), a wide area network (WAN) and a Wireless LAN (WLAN) focusing on their strategic usage • differentiate between various transmission methods - Bluetooth - Near Field Communication (NFC) - other wireless - cables
5.6 Networking	• demonstrate an understanding of the use of different types of computer networks	• describe the basic types of network such as: - peer-to-peer - client-server • describe how communication links are established between computers by the use of protocols, e.g. TCP/IP • describe wireless technology • discuss the advantages and disadvantages of networking
	• demonstrate an understanding of cloud computing	• define cloud computing • describe and discuss cloud computing focusing on - economic impact - services available, including Software as a Service (SaaS); Platform as a Service (PaaS); Infrastructure as a Service (IaaS)

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 6: COURSEWORK		
6.1 Analysis of the problem	• know how to use the following steps involved in systems analysis:	
	- general statement	• define a problem concisely, including the background to the organisation with the problem to be solved
	- specific objectives	• state clearly the specific objectives to be achieved in order to solve the defined problem
	- description of the existing solution	• describe the current situation. This is achieved by the use of fact finding methods
	- evaluation of existing solutions	• evaluate the current situation
	- description of other possible solutions to the problems	• describe at least two possible solutions to the problem, including the proposed solution
6.2 The candidate's solution to the problem	• know how to use the following steps in the solution: - design	• present a clear overall plan including a Gantt chart
		• break the whole problem into sub-problems as separate modules that are easily distinguishable
		• design the solution of each module using algorithm tools
		• select hardware in line with the system requirements and give at least two reasons why such hardware is needed
		• select software in line with the system requirements, including an implementation tool such as: - programming language - query language and macros

THEMES AND TOPICS	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
THEME 6: COURSEWORK (continued)		
6.2 The candidate's solution to the problem (continued)	• know how to use the following steps in the solution (continued):	
	- implementation (development)	• translate each module's algorithm into a solution using any of the selected implementation tools stated above • provide accurate solutions to the given objectives • implement the solution using programming language or query language and macros
	- testing	• apply test strategies to test programs developed and select appropriate test data, expected results linked to specific objectives • show the results of testing using normal, extreme and abnormal data and covering all aspects of functionality
	- documentation	• develop technical documentation to enable the understanding and the maintenance of the new solution • develop user documentation including instructions and sample runs of the new solution
	- evaluation	• evaluate the new system to assess if it is matching the specific objectives • highlight suggestions for development

6. ASSESSMENT OBJECTIVES

The NSSC Computer Studies Ordinary Level syllabus has three assessment objectives:

A. Knowledge with understanding
B. Skills (Problem solving)
C. Communication

A description of each assessment objective follows.

A. Knowledge with understanding

The candidate should be able to:

1. describe and explain the importance of computing in a range and scope of information processing applications
2. analyse and describe the effects of the use of computer technologies on social, legal, ethical and economic aspects
3. describe and explain the range of equipment, tools and techniques used to solve problems
4. describe and explain the functions of the main hardware and software components of information processing systems
5. use appropriate information systems terminology

B. Skills (Problem solving)

1. identify problems within the field of information processing
2. analyse problems and draw up specifications for their computer-based solutions
3. select from a range of resources those which are most suitable for solving problems
4. implement and document solutions using appropriate hardware and software
5. test, evaluate and refine solution systematically

C. Communication

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

7. SCHEME OF ASSESSMENT

Assessment consists of one written paper and a coursework paper. All candidates must take both papers, and there is no choice of questions in either paper.

Description of papers:

Paper 1	**2 hours 30 minutes**	**100 marks**	**Weighting 70%**

Paper 1 will contain a variety of compulsory questions of variable mark value, which require answers of varying length and difficulty. The questions will be based on all sections of the syllabus in line with the assessment objectives. At least one question will assess learners on algorithms.

Paper 2	**Extended period (2 years)**	**50 marks**	**Weighting 30%**

Paper 2 consists of a compulsory coursework where candidates must identify a significant problem and document their attempts to solve it as stipulated in Theme 6 of this syllabus. A single piece of coursework of a complex nature, involving the use of a computer to solve a specific problem, is to be carried out over an extended period. This will enable the students to use their skills and experience gained during the course to analyse, design, implement, test and evaluate the solution to a problem.

The purpose of the project is to allow candidates the opportunity to demonstrate their ability to undertake a complex piece of work, which is a computer-based solution to a significant problem, and to complete the solution and present their results.

A complex piece of work is one which will:

(i) integrate components of two generic application packages to form a single solution, and/or
(ii) use some of the more advanced functionality of a single application package, and/or
(iii) use modules and file handling in a coded solution

In all cases, the solution must be fully documented. Candidates should be warned that the project should be their own work. Where other sources are solicited, proper acknowledgement should be provided. Failure to comply with this, may lead to the nullification of the candidate's result.

Both papers are compulsory and a candidate must do both to obtain a grade. Failure to hand in Paper 2 (coursework) will lead to no an incomplete result in the subject and not only in the component.

Papers	Weighting of papers	Marks	Time
Paper 1	70%	100	2 hours 30 minutes
Paper 2	30%	50	Extended Period (2 years)

8. SPECIFICATION GRID

A rigid association between particular Assessment Objectives and individual examination components is not appropriate since any of the objectives can be assessed in any question. Nevertheless, the two components of the scheme will differ in the emphasis placed on the various objectives. For example, the assessment of the analysis of the impact of computer technologies uses (objective 2: see assessment objectives) is particularly important in Paper 1; while documentation of solutions (objective 13: see assessment objectives) is particularly important in Paper 2. The grids below are for general guidance only and illustrate where particular objectives might receive most emphasis.

Assessment objective	Written Paper (%)	Coursework (%)	Total (%)
A Knowledge and understanding	28	4	32
B Problem-solving	20	20	40
C Communication	22	6	28
TOTAL	**70**	**30**	**100**

In general, Paper 1 of the NSSC Computer Studies Ordinary Level examination will assess all sections whilst Paper 2 will concentrate on section 5 of the NSSC Computer Studies Ordinary Level syllabus. The assessment objectives will be interpreted as appropriate to the different topics in the five sections of the curriculum content.

Assessment Objectives	Paper 1	Paper 2
A	√	
B	√	√
C	√	

9. GRADE DESCRIPTIONS

Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by Learners awarded particular grades. The grade assessment will depend, in practice, upon the extent to which the candidate has met the assessment objectives overall and it might conceal weakness in one aspect of the examination which is balanced by above average performance in some other aspect. Learners will be graded on a scale of A*-G. The descriptors for judgmental thresholds (A, C, E and G) are given below.

At Grade A, the learner is expected to demonstrate mastery in:
(Paper 1)
- knowing and understanding the principles and applications of computing
- understanding and formulating algorithms
- expressing ideas about the effects of computing on society and individuals

(Paper 2)
- applying methods and techniques of:
  - analysis to define a given problem
  - designing a solution to a given problem
  - implementing a solution to a given problem using a selected programming language or using a query language and macros facilities including coding
- communicating clearly the solution to a given problem

At Grade C, the learner is expected to demonstrate general competence in:
(Paper 1)
- knowing and understanding the principles and applications of computing
- understanding and formulating algorithms
- expressing ideas about the effects of computing on society and individuals

(Paper 2)
- applying methods and techniques of:
  - analysis to define a given problem
  - designing a solution to a given problem
  - implementing a solution to a given problem using a query language and macros facilities without coding
- communicating generally the solution to a given problem

At Grade E, the learner is expected to demonstrate a basic competence in:
(Paper 1)
- knowing and understanding the principles and applications of computing
- understanding and formulating algorithms
- expressing ideas about the effects of computing on society and individuals

(Paper 2)
- applying methods and techniques of:
  - analysis to define a given problem
  - designing a solution to a given problem
  - implementing a solution to a given problem using a query language and macros facilities without coding
- communicating generally the solution to a given problem

At Grade G, the learner is expected to demonstrate some basic competence in:
(Paper 1)
- knowing and understanding the principles and applications of computing
- understanding and formulating algorithms
- expressing ideas about the effects of computing on society and individuals

(Paper 2)

- applying methods and techniques of:
  - analysis to define a given problem
  - designing a solution to a given problem
  - implementing a solution to a given problem using a query language and macros facilities without coding
- communicating generally the solution to a given problem

10. GLOSSARY OF TERMS

3G	(short for 3rd Generation) is an access technology that made Internet connection on mobile devices possible. (The first generation was analogue and enables voice calls, while the second generation also made text messaging possible)
4G	(short for 4th Generation) is a communications standard intended to replace 3G, delivering Internet access at a much higher speed
5G	(short for 5th Generation) is once again an improvement on 4G. (This high-speed service enables the user to download an 8 Gb HD movie in 6 seconds – with 4G it will take 7 minutes)
AI	(Artificial Intelligence) computer programs that can solve problems creatively
Actuator	is a device, controlled by a computer, that moves something when commanded to do so, or causes any other effect on the real world, e.g. electric motor / light bulb / heater switched on
Algorithm	is a precise rule (or set of rules) specifying how to solve a problem
ARQ	(Automatic Repeat reQuest , also known as Automatic Repeat Query) is an error-control method for data transmission that uses acknowledgements and timeouts to achieve reliable data transmission over an unreliable service
Binary	(base 2) is a system in which information can be expressed by combinations of the digits 0 and 1
Biometric password	is using human physical characteristics (face shape, finger prints, etc) for identification
Buffer	is a waiting area where data can rest while a slower device catches up
Checksum	is a method of detecting errors in data transmission; a calculated value is used to determine the integrity of transmitted data
Cloud computing	is the practice of using a network of remote servers – hosted on the Internet – to store, manage and process data rather than using a local server or a personal computer
Define	is to give a precise meaning of word or expression
Describe	is to state in words the main points of the current topic

Discuss	requires the learner to give a critical account of the points involved in the topic and advantages and disadvantages should be used to emphasise and support ideas and arguments highlighted.
Drone	is an unmanned aerial vehicle (UAV) which may be remotely controlled or can fly autonomously through software-controlled flight plans in their embedded systems working in conjunction with GPS. Initially used for military purposes in hazardous regions
Dry run	is a testing tool used in programming to verify the correctness of a programme (algorithm or computer programme)
E	(Edge – Enhanced Data rates for GSM Evolution) provides somewhat faster data transfer rates than GPRS, but slower than 3G
Explain	is to give an account of something with enough clarity and detail to be understood by somebody else
Extranet	is a network similar to an intranet that also allows secure access by certain outside users, such as suppliers or customers
GIF	(Graphics Interchange Format); an image file format commonly used for images on the web and sprites in software programs. May be animated
GPRS	(General Packet Radio Service) is a data service that works in combination with 2G and 3G GSM phones to provide slow-speed data transfer
GSM	(Global System for Mobile communication) is a wireless digital network technology used for mobile phones worldwide. GSM phones make use of a SIM card to identify the user's account
H and H+	on mobile phones this is an indication of the Internet speed; faster than 3G and makes music streaming more reliable
Handshaking	is the process by which two devices initiate communications before data transfer takes place by establishing a set of rules
Hexadecimal	numbers (also called base 16) are 0-9 and then use the letters A-F
HTML	(HyperText Markup Language) is the language used to create web pages
IaaS	(Infrastructure as a Service) is a form of cloud computing that provides virtualised computing resources over the Internet – servers, storage and networking on demand

IDE	(Integrated Development Environment) is an application that facilitates software development; a graphical user interface (GUI) is used to 'build' software, making use of a variety of available tools
Internet of Things	(IoT) the network of physical objects with electronics, software, sensors, and connectivity. May also refer to the increase of available apps
Interrupt	is when a current task is stopped in order to process a more important task
Intranet	is a restricted computer network; a private network created using World Wide Web software
JPEG	a format for compressed colour images, can achieve high compression but with some loss in quality; much used on the Internet
LMS	(Learning Management System) is software used for managing training (usually a database system). Features include an environment where testing and reporting can be made. Examples include on-line courses and training
MAC	(Media Access Control) address is your computer's unique hardware number (in a network)
MIDI	a standard protocol for communication between electronic musical instruments and computers
MP3	a method of audio compression, allowing good quality sound reproduction from a small amount of compressed data
MP4	same as MP3, but for video
OTP	(one-time password) is only valid for one login session or transaction
Nanotechnology	is the branch of engineering that deals with things smaller than 100 nanometers (especially with the manipulation of individual molecules).
Nano drone	is a fully functional drone (usually very small) that uses nanotechnology
NFC	Near Field Communication is a short range wireless RFID technology that makes use of interacting electromagnetic radio fields instead of the typical direct radio transmissions used by technologies such as Bluetooth.
PaaS	(Platform as a Service) is a cloud computing model that delivers applications over the Internet. In a PaaS model, a cloud provider delivers hardware and software tools (usually those needed for software development) to its users as a service

Personal Digital Assistant	is a lightweight electronic device that looks like a hand-held computer but instead performs specific tasks; can serve as a diary or a personal database or a telephone or an alarm clock, etc.
Phishing	is trying to convince an Internet user to reveal personal details (like passwords and credit card information) on a fake web page or e-mail form pretending to come from a legitimate company (like their bank).
Polling	is the process where the computer checks an external device for its readiness to receive data; if that device is ready, data is sent, if it is not ready, the next device is checked. Polling may also be a device that is requesting data to be sent
PUK	(PIN unlock key) is used to reset a forgotten PIN
QR code	(abbreviated from Quick Response Code) a machine-readable code consisting of an array of black and white squares, typically used for storing URLs or other information for reading by the camera on a smartphone
Router	is a device that forwards data packets between computer networks.
SaaS	(Software as a Service) is any cloud service where consumers are able to access software applications over the Internet
Spoofing	a technique used to gain unauthorised access to computers, whereby the intruder sends messages to a computer with an IP address indicating that the message is coming from a trusted host
Spooling	(simultaneous peripheral operations on-line) is putting jobs (most often print jobs) in a buffer where a device can access them when it is ready
TCP/IP	(Transmission Control Protocol/Internet Protocol) is the basic communication language or set of rules of the Internet
VR	(Virtual Reality) the use of computer technology to create a simulated 3D environment
World Wide Web	is a computer network consisting of a collection of internet sites that offer text and graphics and sound and animation resources through the hypertext transfer protocol.
ZIP	a file format that supports lossless data compression

ANNEXE A: ASSESSMENT CRITERIA FOR COURSEWORK (SCHOOL-BASED ASSESSMENT)

ANALYSIS	0 mark	1 mark	2 marks	3 marks	4 marks
1. Description of the problem	Problem not identified at all	Brief description of the background of the business or organisation	Description of the background of the business or organisation, together with the nature of the problem to be solved		
2. Objectives (must be stated in relation to the proposed solution)	Not stated at all	Objectives listed in general business terms, e.g. to make a process faster, to save time or resources	Objectives listed in computer-related terms, e.g. create a database, sort, search a database, edit a record, etc.	Objectives listed in both general business terms and computer-related terms	
3. Description of current situation	Not described at all	Incomplete description of the current situation	A full description of the current situation, including data input requirements (data capture methods and data dictionary, if applicable) and specifications, the data processing and output requirements and specifications		
4. Evaluation of current situation	Not evaluated at all	Incomplete evaluation of the current situation	Complete evaluation of the current situation highlighting advantages, disadvantages		

ANALYSIS	0 mark	1 mark	2 marks	3 marks	4 marks
5. Description of other possible solutions, (including the proposed solution)	No other solution proposed	Description of one other possible solution, i.e. the proposed solution	Description of the proposed new solution and at least one other solution		

Candidate's solution to the problem

DESIGN	0 mark	1 mark	2 marks	3 marks	4 marks
6. Action plan, in terms of systems life cycle	No action plan developed	Incomplete or unclear action plan	Detailed action plan, including time schedule	Detailed formal plan, including a Gantt chart	
7. Separate modules (top-down design)	Not done	Clear but incomplete	Clear and complete, related to the system requirements		
8. Description of the method of solution of each defined module	No description done	Unclear or confused method of solution	Clear method of solution but some aspects of the method of solution are missing	Clear and detailed description of the method of solution**,** including database tables, any relationships (Must include annotation or explanation of at least one module of any software generated coding/queries)	

DESIGN	0 mark	1 mark	2 marks	3 marks	4 marks
9. Hardware requirements	Not done	A list of hardware only	A list of hardware needed with one reason why such hardware is needed in the context of the proposed solution	A list of hardware together with at least two reasons why such hardware is needed in the context of the proposed solution	
10. Software requirements	Not done	List of software used only	Description of the software used	A list of software needed with reasons why such software is needed in the context of the proposed solution	
IMPLEMENTATION (Development)					
11. Programming code	Not done	Use macros or pre-written code	Code and annotate own macro(s)	Code and annotate complete solution in any programming language	
TESTING					
12. Test strategy (Must include the expected results)	No test strategy	Incomplete test strategy, which must include the data to be tested together with the expected results	Complete test strategy, which must include the data to be tested together with the expected results	Complete test strategy, which must include the data to be tested together with the expected results and linked to the objectives in section 2	
13. Test results (Normal, Extreme, Abnormal data)	No test done	One type of data tested	Two types of data tested	Three types of data tested	Three types of data tested covering all aspects of functionality - data input and processes

DOCUMENTATION	0 mark	1 mark	2 marks	3 marks	4 marks
14. Technical documentation	No documentation available.	Overall report including contents page but unclear or inadequate documentation	Overall report contents page and clear and complete document–tation which would enable maintenance or modification of the system		
15. User documentation	No user documentation available	Inadequate or unclear details	Clear details but incomplete	Clear and complete user guide	
SYSTEM EVALUATION & DEVELOPMENT					
16. Evaluation	No evaluation done	Inaccurate or trivial evaluation	Reasonable evaluation	Reasonable evaluation linked to the computer objectives in section 2 and the testing	
17. Opportunities for developments	Not done	Some minor improvements suggested	Realistic and meaningful suggestions for development		
18*. Method of solution related to the problem by suitable means, including annotated coding, spreadsheet formulas, database tables, and site plans of website	Not done	A general solution not broken down into modules	A modular solution		
19*. Accurate method of solution	No solution available	Partly successful, some of the computer-related objectives achieved as listed previously	Mostly successful, all of the computer-related objectives achieved	Completely successful, all of the computer-related objectives achieved	

*** PLEASE NOTE THAT SECTIONS 18 AND 19 ARE INTENDED FOR THE MARKER'S USE ONLY. CANDIDATES SHOULD NOT INCLUDE THESE SECTIONS IN THEIR COURSE WORK**

ANNEXE B: COMPUTER STUDIES INDIVIDUAL CANDIDATE RECORD CARD ORDINARY LEVEL

Centre Number						**Centre Name**																	
Candidate Number						**Candidate Name**														**Teaching Group/Set**			
Project Name:																							
	Analysis					Design					Imple men-tation	Testing		Documen-tation		Evaluation		Examiner					
	Description of the Problem	Specific Objectives	Description of existing solution	Evaluation of existing solution	Description of other possible solutions	Overall plan	Separate Modules	Description of method of solution	Hardware requirements	Software requirements	Programming code	Test strategy	Test results	Technical documentation	User documentation	Evaluation	Opportunities for system development	Method of solution related to problem	Accurate method of solution	**TOTAL**			
Section	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**				
Max	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**4**	**2**	**3**	**3**	**2**	**2**	**3**	**50**			
Mark																							
Page(s)																		===	===	===			
Name of teacher completing this form									Signature							Date							
Name of internal moderator									Signature							Date							
I declare that this project is my own work.																							
Name of the learner									Signature							Date							

The National Institute for Educational Development
P/Bag 2034
Okahandja
NAMIBIA

Telephone: +264 62 509 000
Facsimile: +264 62 509 073

E-mail: info@nied.edu.na
Website: http://www.nied.edu.na