

NATIONAL BOARD FOR TECHNICAL EDUCATION

NATIONAL TECHNICAL CERTIFICATE (NTC)

AND

ADVANCED NATIONAL TECHNICAL CERTIFICATE (ANTC)

IN

**COMPUTER AND GLOBAL SYSTEM MOBILE HANDSET (GSM)
MAINTENANCE CRAFT PRACTICE**

CURRICULUM AND COURSE SPECIFICATION

APRIL, 2008

GENERAL INFORMATION

AIM

To give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant.

Entry Qualifications

Craft Programme

Candidates must have successfully completed three years of Junior Secondary education or its equivalent. Special consideration may be given to sponsored candidates with lower academic qualifications who hold trade test certificates and are capable of benefiting from the programme.

Advanced Craft Programme

Candidates should possess the National Business Certificate or its equivalent and should have had a minimum of two years post qualification cognate industrial experience.

The Curriculum

The Curriculum of each programme is broadly divided into three components:

General Education, which accounts for 30% of the total hours required for the programme.

Trade Theory, Trade Practice and Related Studies which account for 65% and

Supervised Industrial Training/Work Experience, which accounts for about 5% of the total hours required for the programme. This component of the course, which may be taken in industry or in college production unit, is compulsory for the full-time students.

Included in the curriculum is the teacher's activity and learning resource required for the guidance of the teacher.

Unit Course/Modules

A Course/Module is defined as a body of knowledge and skills capable of being utilized on its own or as a foundation or pre-requisite knowledge for more advanced work in the same or other fields of study. Each trade when successfully completed can be used for employment purposes.

Behavioural Objectives

These are educational objectives, which identify precisely the type of behaviour a student should exhibit at the end of a course/module or programme. Two types of behavioural objectives have been used in the curriculum. They are:

General Objectives

Specific learning outcomes

General objectives are concise but general statements of the behaviour of the students on completion of a unit of work such as understanding the principles and application in:

- a Orthographic projection in engineering/technical drawing;
- b Loci in Mathematics
- c Basic concepts of politics and government in Political Science
- d Demand and supply in Economics

Specific learning outcomes are concise statements of the specific behaviour expressed in units of discrete practical tasks and related knowledge the students should demonstrate as a result of the educational process to ascertain that the general objectives of course/programme have been achieved. They are more discrete and quantitative expressions of the scope of the tasks contained in a teaching unit.

General Education in Technical Colleges

The General Education component of the curriculum aims at providing the trainee with complete secondary education in critical subjects like English Language, Economics, Physics, Chemistry, Biology, Entrepreneurial Studies and Mathematics to enhance the understanding of machines, tools and materials of their trades and their application and as a foundation for post-secondary technical education for the above average trainee. Hence, it is hoped that trainees who successfully complete their trade and general education may be able to compete with their secondary school

counterparts for direct entry into the polytechnics or colleges of education (technical) for ND or NCE courses respectively. The Social Studies component is designed to broaden the trainee's social skills and his understanding of his environment.

For the purpose of certification, only the first three courses in mathematics will be required. The remaining modules are optional and are designed for the above average students.

National Certification

The NBC and ANBC programmes are run by Technical Colleges accredited by NBTE. NABTEB conducts the final National examination and awards certificates.

Trainees who successfully complete all the courses/modules specified in the curriculum table and passed the national examinations in the trade will be awarded one of the following certificates:

S/NO	LEVEL	CERTIFICATE
	Technical Programme	
1.	Craft Level	National Business Certificate
2.	Advanced Craft Level	Advanced National Business Certificate

Guidance Notes for Teachers Teaching the Curriculum

The number of hours stated in the curriculum table may be increased or decreased to suit individual institutions' timetable provided the entire course content is properly covered and the goals and objectives of each module are achieved at the end of the term.

The maximum duration of any module in the new scheme is 300 hours. This means that for a term of 15 weeks, the course should be offered for 20 hours a week. This can be scheduled in sessions of 4 hours in a day leaving the remaining hours for general education. However, (properly organized and if there are adequate resources), most of these courses can be offered in two sessions a day, one in the morning and the other one in the afternoon. In so doing, some of these programmes may be completed in lesser number of years than at present.

The sessions of 4 hours include the trade theory and practice. It is left to the teacher to decide when the class should be held in the workshop or in a lecture room.

INTEGRATED APPROACH TO THE TEACHING OF TRADE THEORY, TRADE SCIENCE AND TRADE CALCULATION

The traditional approach of teaching trade science and trade calculation as separate and distinct subjects in technical college programmes is not relevant to the new programme as it will amount to a duplication of the teaching of mathematics and physical science subjects in the course. The basic concepts and principles in mathematics and physical science are the same as in the trade calculation and trade science. In the new scheme therefore, qualified persons in these fields will teach mathematics and physical science and the instructors will apply the principles and concepts in solving trade science and calculation problems in the trade theory classes. To this end, efforts have been made to ensure that mathematics and science modules required to be able to solve technical problems were taken as pre-requisite to the trade module.

Evaluation of Programme/Module

For the programme to achieve its objectives, any course started at the beginning of a term must terminate at the end of the term.

Instructors should therefore devise methods of accurately assessing the trainees to enable them give the student's final grades at the end of the term. All students who have successfully completed their modules will take a national examination. The final award will be based on the aggregate of the scores attained in the course work and the national examination.

CURRICULUM TABLE FOR NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS

S/N	COURSE CODE	SUBJECT MODULE	Y	E	A	R	-	1	Y	E	A	R	-	2	Y	E	A	R	-	3	TOTAL DURATN
-	-	-	TM	1	TM	2	TM	3	TM	1	TM	2	TM	3	TM	1	TM	2	TM	3	-
-	-	-	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	-
1	CMA 12-15	Mathematics	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	216
2	CEN 11-17	English Lang	2	-	2	-	2	-	3	-	3	-	3	-	3	-	3	-	3	-	288
3	CPH 10-12	Physics	2	-	2	-	2	-	2	1	2	1	2	1	2	1	2	1	2	1	288
4	CCH 11-12	Chemistry	2	-	2	-	2	-	2	1	2	1	2	1	2	1	2	1	2	1	288
5	CBB 11-13	Biology	2	-	2	-	2	-	2	1	2	1	2	1	2	1	2	1	2	1	288
6	CEC 11-13	Economics	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	216
7	CBM 10	Entrepreneurship	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	2	-	72
8	ICT 11-15	Computer Studies	-	-	-	-	-	-	1	2	1	2	1	2	1	2	1	2	-	-	180
9	CTD 11-13	Drawings	-	3	-	3	-	3	-	3	-	3	-	3	-	2	-	2	-	2	288
7	CEI 11	Basic Electricity	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	300
8	CRT 12	Electronics Devices & Circuits	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	108
9	CCS 11	Computer System Maintenance	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	108
10	CCS 12	Computer System Maintenance	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	108

CURRICULUM TABLE FOR ADVANCED NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS

S/N	COURSE CODE	SUBJECT MODULE	TERM 1		TERM 2		TERM 3		TOTAL DURATION
			L	P	L	P	L	P	
1	CMA 21-22	Mathematics	2	-	2	-	2	-	72
2	CEN 21-22	English Lang & Communication	2	-	2	-	2	-	72
3	CEC 21-23	Economics	2	-	2	-	2	-	72
4	CEM 21	Entrepreneurship	2	-	2	-	2	-	72
5	ICT 21-22	Auto card	1	2	1	2	1	2	72
6	CCS 21	Intro to Computer networking	1	3	1	3	1	3	48
7	CSM 22	Global System of mobile Communication	2	4	2	4	2	4	48

PROGRAMME: National Technical Certificate in Computer and Global System Mobile (GSM) Handsets Maintenance Craft Practice

MODULE: CEI II – BASIC ELECTRICITY

DURATION: 300 HOURS

GOAL: This module is designed to provide the trainee with basic knowledge of electricity and the competency to wire simple circuits and use common electrical measuring instruments.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

- 1.0 Understand the structure of matter and its relevance to electricity/electronics.
- 2.0 Understand the chemical sources of Electro Motive Force (EMF).
- 3.0 Understand the construction of resistors, inductors and capacitors and explain their functions in a simple circuit
- 4.0 Understand Resistor and Capacitor colour coding.
- 5.0 State Ohm's Law and applies it to calculate resistance, voltage and current.
- 6.0 Distinguish between AC and DC currents and voltages.
- 7.0 Understand the principles of transformer, its construction and operations.
- 8.0 Connect, analyze and carry out calculation on simple electrical circuits.
- 9.0 Understand the operations, uses and limitations of indicating and measuring instruments and operate them.

PROGRAMME: NTC IN COMPUTER AND GSM HANDSETS MAINTENANCE CRAFT PRACTICE			
COURSE: CEI II – BASIC ELECTRICITY		COURSE CODE: CEI II	YEAR 1, TERM 1, CONTACT HOURS: 2-1
Course Specifications : At the conclusion of this module, the student should be able to understand and demonstrate the basic electrical theory			
Theoretical Content			
Week	General Objective: 1.0 Understand the Structure of matter and its relevance to electricity/electronics.		
	Specific Learning Objectives	Teachers' Activities	Resources
1	Structure of Matter 1.1 Define: (i) Molecule (ii) Electron (iii) Atom (iv) Electric charge (v) Electric Current (vi) Coulomb	With diagram define atom, electron, proton, molecule, electric charge, electric current, Coulomb.	<ul style="list-style-type: none"> • Chalkboard • Textbooks • Models
2	1.2 Explain the difference between positive and negative charges.	Give full explanation on the difference between positive and negative charges.	Chalk Board
	1.3 Explain the flow of electricity	Describe how electricity flows.	Chalk Board
3	1.4 Distinguish between insulators and conductors	Explain insulator and conductors with sample	Chalk Board

Week	General Objective: 2.0 Understand the chemical source of electromotive force.		
	Specific Learning Objectives	Teachers Activities	Resources
4	Electro Motive Force [emf] 2.1 Define: (i) current (ii) voltage (iii) e.m.f (iv) electric power (v) energy	Explain electric power and energy stating their unit, symbol and formula. Work problems based on Power and Energy	<ul style="list-style-type: none"> • Chalkboard • Textbook •
5	2.2 Distinguish between e.m.f. and potential difference (p.d)	Distinguish the differences between emf and p.d.	<ul style="list-style-type: none"> • Chalkboard • Textbook
6	2.3 Identify the following: Primary Cells Secondary Cells	Show Primary and Secondary Cells and describe their constructions.	<ul style="list-style-type: none"> • Primary cell • Battery
			•
8	2.4 Connect cells in: i. Series ii. Parallel iii. Series – Parallel	Guide students to connect cells in series, parallel and series -parallel Explain the advantages of cells in series or parallel connections.	Primary Cell Connectors Bulbs Voltmeter Rheostat Ammeter
9	2.5 Explain the effects of internal resistance on battery voltage output.	Explain with calculations how resistance affects battery voltage.	<ul style="list-style-type: none"> • Chalkboard

Week	General Objective: 3.0 Understand the construction of resistors, inductors and capacitors and explain their functions.		
	Specific Learning Objectives	Teachers Activities	Resources
10	Resistors, Inductors and Capacitors 3.1 Identify the various types and sizes of the following: i. Resistors ii. Capacitors iii. Inductors.	Define and show resistors, capacitors and inductors. State their units and symbols	<ul style="list-style-type: none"> • Capacitors • Inductors • Resistors
11	3.2 Identify the following resistors: i. Carbon type resistor ii. Wire wound type resistor iii. Variable resistors iv. Fixed resistors	Show students various types of resistors	<ul style="list-style-type: none"> • Resistors
10	3.3 State the symbols, and functions of the following in a circuit: i. Resistors ii. Capacitors iii. Inductors	Explain and show using model circuits the functions of resistors, capacitors and inductors	<ul style="list-style-type: none"> • Resistors • Capacitors • Inductor
10	3.4 Describe the constructional detail of the following: i. Resistors ii. Capacitors iii. Inductors	Describe on chalkboard the constructional detail of the three components.	<ul style="list-style-type: none"> • Chalk Board • Components
11	3.5 Explain the meaning of power rating of a resistor	Explain power rating of resistor.	<ul style="list-style-type: none"> • Chalk Board
11	3.6 Identify the power rating of different resistance types.	Show how to identify the power rating of each resistor.	<ul style="list-style-type: none"> • Resistors of different power ratings
11	3.7 Explain the practical application of various types of resistors	Explain the application of resistor in a circuit.	<ul style="list-style-type: none"> • Chalk Board

11	3.8 Identify the working Voltage of a capacitor	Explain the maximum working voltage of a capacitor.	<ul style="list-style-type: none"> Chalk Board
	3.9 Explain the applications of various types of inductance	List the application of various types of inducting in circuits	<ul style="list-style-type: none"> Different type
Week	General Objective: 4.0 Understand resistor and capacitor colour coding		
12	Specific Learning Objectives	Teachers Activities	Resources
	Values of Resistors and Capacitors	Show and explain how to identify colour coding of resistors and capacitors.	<ul style="list-style-type: none"> Chalkboard Textbooks Resistor and Capacitor colour code charts
	4.1 Explain the colour coding system of <ol style="list-style-type: none"> resistors capacitors 		
13	4.2 Determine the following: <ol style="list-style-type: none"> Resistance of a resistor using colour codes Capacitance of a capacitor using colour codes 	From colour code, show how to calculate the values of resistor and capacitor	<ul style="list-style-type: none"> Chalk Board Color coded resistors and Capacitors Colour charts
13	4.3 Determine the tolerance of resistors and capacitors.	Show and calculate the tolerance of resistors and capacitors	<ul style="list-style-type: none"> Chalk Board Colour code charts
WEEK	General Objective: 5.0 State Ohm's law and apply it to calculate resistance, voltage and current. Year 1 Term 2		
	Contact Hour: 1-2		
1	Specific Learning Objectives	Teachers Activities	Resources
	Ohm's Law and Simple Circuits:	Define Ohm's Law	Chalk Board
5.1 Define Ohm's law			
1	5.2 Calculate Resistance, Voltage or Current using Ohm's law e.g. <ul style="list-style-type: none"> $R = V/I$ 	Solve some problems using Ohm's law	Chalk Board

	5.3 Determine the equivalent value of: a. resistors in series b. resistors in parallel c. series and parallel connection	Show how resistor can be connected in series, parallel and series-parallel	Chalk Board
2-3	5.4 Determine the equivalent voltage of: a. batteries in series b. batteries in parallel c. batteries in series parallel connection	Show how batteries can be connected in the three modes by asking questions.	Chalk Board
4-7	5.5 Determine the equivalent value of capacitors connected in series, parallel and series parallel	Show how capacitors can be connected in series, parallel and in series-parallel.	Chalk Board
8-9	5.6 Determine the equivalent value of inductance, connected in series and parallel	Show how inductors are connected in series and parallel by asking questions	Textbooks Chalkboard
10	5.7 Define Kirchoff's laws:- Current law Voltage law	Define the laws. Use vector diagrams to explain the current and voltage law. e.g. $I_1 + I_2 + I_5 = I_3 + I_4$	Chalkboard
11	5.8 Solve simple numerical problems involving 5.7 above.	Draw simple circuits to illustrate the laws	Chalkboard
12	5.9 Define Superposition theorem	State the law. Draw a simple circuit to illustrate the law	Chalkboard
13	5.10 Solve simple numerical problems to illustrate Superposition theorem	Use simple circuits to illustrate the theorem.	Chalkboard
WEEK	General Objective: 6.0 Distinguish between AC and DC Current and Voltages: Year 2, Term 1 Contact Hour: 3-3		
	Specific Learning Objectives	Teachers' Activities	Resources
1	AC and DC Quantities 6.1 Explain the characteristics of ac and the difference between AC and DC quantities.	With the aid of a diagram explain the difference between AC and DC.	Chalkboard
3	6.2 Define peak value, mean value, rms value, and frequency of a sine wave.	Draw diagrams to explain AC variables like rms mean value, etc.	Chalk Board

4	6.3 Calculate peak value from r ms values of current, and voltage, and vice- versa	Work some examples on how to calculate the variables above	Chalk Board
5	6.4 Describe the effect of the following in AC circuit: i. R ii C. iii.L	Explain the effect of AC on R, I. & C i.e voltage and current relationships	Chalk Board
6	6.5 Calculate inductive and capacitive reactance. $X_L = 2\pi fL$ (Inductive reactance) $X_c = \frac{1}{2\pi fC}$ (Capacitive reactance)	Explain inductive and capacitive reactance and work some calculation on X_L , and X_c ,	• Chalk Board
	6.6 Describe the combined effort of R, L and C in AC circuit	Explain the voltage and current relationship in R – L – C in series and parallel	Chalk Board
Week	General Objective: 7.0 Understand the principles of transformer, its construction and operations.		
	Specific Learning Objective	Teachers Activities	Resources
8	Transformers 7.1 Explain the following concepts: a. magnetism b. temporary and permanent magnets c. magnetic field d. magnetic poles e. law of attraction and repulsion	Define magnetism and explain temporary and permanent magnet. Define laws of magnetism, show diagrams where necessary.	• Chalkboard
9	7.2 Explain the effect of fields as applied to electro-magnetism	Show and explain magnetic fields.	• Chalkboard • Electro magnets
10	7.3 State the colour code used for the winding of transformer.	Show the colour codes of transformer.	• Colour coded transformer
10	7.4 Describe with the aid of sketches the principles of operation of a single phase, double wound transformer.	Explain $\frac{V_P}{V_S} = \frac{N_P}{N_S}$	• A transformer • Chart • Chalk Board

12	7.5 Explain the types of losses in transformers and Ways to reduce them in transformers.	List and explain iron and copper loss and how to reduce them	Chalkboard Laminated Transformer Core
	7.6 Calculate transformer efficiency	Explain efficiency and work some sample on efficiency	Chalkboard
	7.7 Identify the following types of transformers: a. Auto-transformer; b. C-Core transformer; c. Toroidal transformer. d. Rudolf transformer e. Audio transformer f. 3-phase transformer g. Current transformer	Show and state the different types of transformers and state their uses e.g. power, isolation auto etc. Make available for inspection a number of examples.	Different types of transformers
Week	General Objective: 8.0 Connect, analyze and carry out calculations on simple electrical circuit. Year 2, Term 2 Contact Hour: 2-3		
1	Specific Learning Objectives	Teachers Activities	Resources
	Electrical Circuit 8.1 Explain the difference between series and parallel circuit	Define an electric circuit and state the difference between series and parallel.	<ul style="list-style-type: none"> • Chalkboard • Textbooks/Notes
1	8.2 Calculate the total resistance in a series d.c. circuit	Give students problems to solve	<ul style="list-style-type: none"> •
2	8.3 Calculate the voltage drop across each resistor of a series circuit	Give students problems to solve on Voltage drop across each resistor in a circuit.	<ul style="list-style-type: none"> • Calculator • Chalkboard
			<ul style="list-style-type: none"> •
5	8.4 Calculate the current in each arm of a parallel circuit.	Guide students to calculate the current in each arm.	<ul style="list-style-type: none"> • Chalk Board
6	8.5 Investigate the effect of capacitor in an electric circuit.	Ask question on connection of capacitor.	<ul style="list-style-type: none"> • Chalk Board

8	8.6 Calculate the voltage and current in a series and parallel circuit.	Guide students to calculate voltage & current in series and parallel circuit.	<ul style="list-style-type: none"> Chalk Board
9	8.7 Explain the effect of power factor in AC circuits	Explain methods of improving power factor	<ul style="list-style-type: none"> Chalk Board
10	8.8 Calculate impedance in an AC Circuits	Define impedance, give the symbols, unit and formula for calculating impedance	<ul style="list-style-type: none"> Textbooks Calculator Chalk Board
11	8.9 Explain the meaning of resonance in AC circuits: a. series circuits b. parallel circuits	Draw and explain resonance in series and parallel as circuit and carry out simple calculations.	<ul style="list-style-type: none"> Chalk Board
12	8.10 Explain the simple meaning of a. Q factor b. Bandwidth c. Resonant frequent	Define of, B.W. and Fr. State the relationship among the three. Do some calculations on the three.	<ul style="list-style-type: none"> Chalk Board
12-13	8.11 Calculate resonant frequency.	Do some calculations on the three.	<ul style="list-style-type: none"> Chalk Board
Week	General Objective: 9.0 Understand the operation, uses and limitations of indicating and measuring instruments and operate them,		
3-5	Special Learning Objective	Teachers Activities	Resources
	Indicating Instruments		
	9.1 Describe the functions of a Voltmeter, Ammeter, Ohmmeter and Multimeter	Describe the parts, operation and uses of multimeter.	Multimeter – digital and analogue
10-12	9.2 Describe the functional parts of an Oscilloscope.	Show the functional parts of an Oscilloscope	Oscilloscope Chalkboard Note.

	9.3 Explain the limitations of analogue and digital measuring instrument	State the limitation of analogue and digital measuring instrument.	Chalk Board
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PRACTICAL CONTENTS FOR CEI 11 MODULE: BASIC ELECTRICAL

ALL EXPERIMENTS MUST BE PERFORMED BY STUDENTS

	EXPERIMENTS	Teachers’/Students’ Activities	Resources
1-4	Demonstrate by experiment Resistors in Series and in Parallel	Connect Resistors in Series and then in parallels with meters and power supply.	DC Ammeters, DC Voltmeters, Resistors power supply unit.
5-6	Demonstrate by experiments the effect of connecting capacitors in series and in parallel	Connect capacitors in a. in series b. in parallel. Measure current voltage & capacitance	Capacitors, DC Ammeters DC Voltmeters, Power supply. Capacitance meter
9-12	Demonstrate by experiment Ohms law $R = \frac{V}{I}$	Connect resistor R in series with ammeter. Measure current I in R and measure voltage V across R.	
1-6	Demonstrate by experiment – Kirchoff’s laws	Wire such and take readings	Kirchoff’s laws unit.
7-12	Demonstrate by experiment the Superposition theorem.	“	
1-4	Demonstrate by experiment self induction. Natural induction of a coil	Move permanent magnet in an out of the coil and note, deflection on the metre.	Permanent Magnet Galvanometer, induction coil
5-12	R & L in series AC circuit, R+C in series AC circuit		Components, low voltage A.C source
1-6	R & L in parallel AC circuit and R&C in parallel AC circuit		Components, A.C Voltage are Ammeter, RLC circuit modules.
7-12	Demonstrate by experiment series and Parallel resonance in AC circuit.	Connect the circuit and demonstrate variations of frequency at constant voltage	Micrommeter low voltage a.c. source AC Voltmeter oscilloscope component sine wave, signal generator.

		Plot graphs for both series and parallel resonance. Determine the Q-factors.	
7	Test for the condition of a cell or battery	Use instruments and visual observation to show how to test cell condition.	<ul style="list-style-type: none"> • Oscilloscope • Function Generator • Primary Cell • Hydrometer • Voltmeter
13	Construct a simple single phase double wound transformer	Demonstrate how to construct double would	<ul style="list-style-type: none"> • Insulated wires • Laminations • Transformer Core • Varnish • Insulation tape
4	Investigate by experiment, the effect of resistors in series and in Parallel. (Practical content)	Carry out experiment to show the effect of resistor in series and in parallel.	<ul style="list-style-type: none"> • Resistors • DC power supply • multimeter
6-9	Set up the multimeter for for: <ul style="list-style-type: none"> a. AC and DC voltage measurement b. Resistance Measurement c. AC and DC current measurement 	Demonstrate how to use the instrument in measuring current voltage and resistance both on AC and DC Circuits.	<ul style="list-style-type: none"> • Multimeter digital and analogue chalkboard
13	Determine Various waveforms using the Oscilloscope		<ul style="list-style-type: none"> •

EVALUATION GUIDE FOR MODULE CEI II – BASIC ELECTRICITY

The student will be assessed on the basis of demonstrating an understanding of basic electrical theory

Students will be graded on the following Criteria:

Tools,

Assignments and

Terminal Examinations:

The laboratory reports should also be assessed and graded.

PROGRAMME: National Technical Certificate in Computer Maintenance Craft Practice Work

MODULE: CRT 12 – Electronic Devices and Circuits

DURATION: 3-2

PRE-REQUISITE: CE I

GOAL: The module is intended to provide the trainee with the knowledge and skills to enable him understand the functions and characteristics of electronic devices and circuits.

GENERAL OBJECTIVES:

On completion of this module, the trainees should be able to:

- 1.0 Understand the basic principles, characteristics of common electronic devices, such as thermionic devices, transistors, etc.
- 2.0 Know the application of common Electronic Devices.
- 3.0 Know how to identify semi conductor devices
- 4.0 Understand the principles of construction and operation of power supply and be able to construct simple power supply unit
- 5.0 Know the operation of common Oscillator Circuits.
- 6.0 Know the use of binary numbers and Logic Elements
- 7.0 Understand the principles of modulation and detection.
- 8.0 Know the various Acoustics devices/equipment.

NATIONAL BOARD FOR TECHNICAL EDUCATION, KADUNA

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER MAINTENANCE CRAFT PRACTICE.			
COURSE: CRT 12 ELECTRONIC DEVICES AND CIRCUITS		Course Code: CRT 12	Contact Hours: 3-2 Year 2, Term 1
Course Specification			
Practical Content			
WEEK	General Objective: 1.0 Understand the basic principles, characteristics of common electronic devices, such as thermionic devices, transistors, etc.	Teachers Activities	Resources
	Specific Learning Objectives:		
1-4	<p>1.1 Explain the basic concept of (a) Electronic Emission (b) Conductor, insulators and semiconductors</p> <p>1.2 Explain the operations, characteristics and limitations of thermionic diode</p> <p>1.3 Explain the operations, characteristics and limitations of semi-conductor diode.</p> <p>1.4 Explain the effect of load on the characteristics</p> <p>1.5 Define rectification and describe rectification in a diode circuit.</p> <p>1.6 Set up rectifying circuits.</p> <p>1.7 Describe the effect of filter elements on D.C. output voltage for Half wave Rectifier</p> <p>1.8 Describe the effect of filter elements on D.C. output voltage for full wave Rectifiers on Ripples.</p>	<p>Explain types of electronic emission and semi-conductor materials (silicon, germanium)</p> <p>* Make a graphical representation of typical familiar V/I curve for a diode.</p> <ul style="list-style-type: none"> • Use chart to explain the effect of load on the characteristics. Set up a circuit to demonstrate the effect of load on the characteristics. • Explain the concept of rectification. • 	<p>Chalk Board and Pictorial aids,</p> <ul style="list-style-type: none"> • Semi conductor diode, pictorial chart & chalk board. • Chart experiment kit and power-supply • Use pictorial diagram to show different types of Rectification • Practical Rectifier circuits and oscilloscope.

		<ul style="list-style-type: none"> Discuss the differences in operation and state the advantages and disadvantages of semiconductor diodes over thermionic diodes 	Chalk Board, Chart and practical circuits.
Week	General Objective: 2.0 Know the application of the characteristics of common Electronic Devices		
	Specific Learning Objectives:	Teachers' Activities	
5-7	<p>2.1 Explain the operation, characteristics and limitations of the triode and bipolar transistor...</p> <p>2.2 Explain the types of bipolar transistor</p> <p>2.3 Explain transistor configuration.</p> <p>2.4 Explain uses of bipolar transistors and heat sink</p> <p>2.5 Show graphically the effect of load on gain of a transistor.</p> <p>2.6 Determine transistor parameters</p> <p>2.7 Select transistor equivalent replacement using transistor manual.</p> <p>2.8 Describe the operation of photoelectric devices like solar battery, light dependent resistor and diodes..</p> <p>2.9 Describe the structure and design of Cathode Ray Tube</p>	<ul style="list-style-type: none"> Explain the transistor configurations (I) Common Emitter (ii) Common Base (iii) Common collector Determine transistor parameters. $I_e = I_c + I_b$ Calculations on V_{cc}, V_{CE} V_{be} etc. Describe how to select equivalent replacement using transistor manual. 	<ol style="list-style-type: none"> Transistor (NPN & P.N.P.) Power transistor on Heat sink. Pictorial charts. Pictorial charts. Transistor manual.

<p>8-10</p>	<p>2.10 Describe the construction, and application of solid state devices:</p> <ul style="list-style-type: none"> (a) Diode (b) Zener Diode (c) Tunnel Diode (d) Light Emitting Diode (e) Field Effect Transistor (f) Unijunction (g) Thyristor 	<ul style="list-style-type: none"> • . • Explain the working of these photoelectric devices: solar battery, light dependent resistor and diodes. • Give explanation on structure and design of cathode ray tube. • Show their difference symbols and explain their application. 	<p>Resources</p> <ul style="list-style-type: none"> 5. Variable power supply, Ammeter, voltmeter graph Sheets. 6. Solar cell. Light dependent resistor and diode. 7. Vectoral diagrams of the devices. 8. Well sketched diagram of a cathode ray tube on Poster. 9. Diode, Light emitting diode, thristor, zener diode.
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WEEK	General Objective: 3.0 know how to identify semiconductors, devices.		
	Specific Learning Objective:	Teachers Activities	Resources
11	3.1 Identify IC symbol, in circuit diagram 3.2 Identify IC pins	<ul style="list-style-type: none"> • Present different type of IC (s) physically and explain the application • Present an IC to students and show them the various pins. Use also the IC manual for further identification 	<ol style="list-style-type: none"> 1. IC Manual e.g. IC symbol on a chart 2. IC Manual and several IC(s)

General Objective: 4.0 Understand the Principles of Construction and Operation of Power Supply			
Week	Specific Learning Objective.	Teacher's Activities	Resources
1-6	<p>Power Supply</p> <p>4.1 Describe the principle of Operation of Linear power supply.</p> <p>4.2 Identify power supply in a schematic diagram.</p> <p>4.3 Identify half wave and full wave rectification.</p> <p>4.4 Construct a stabilized low-voltage D.C. power supply unit.</p> <p>4.5 Differentiate between half and full wave rectifiers and state their advantages and disadvantages.</p> <p>4.6 Explain the effect of capacitors and inductor in a power supply.</p> <p>4.7 Explain the waveform at various points of power supply.</p>	<ul style="list-style-type: none"> • Introduce a power supply unit to the students. • Show with the aid of a schematic diagram the place of a power supply in a complex circuit. • Illustrate the concept of half-wave and full-wave rectification. • Supervise the construction of a stabilized low-voltage power supply unit. • Distinguish between half-wave and full-wave rectifier circuits, stressing the advantages and disadvantages. • Show samples of capacitors & inductors used in power supply and illustrate their effect on the output of a power supply. • Explain the waveforms of various stages of a power supply and monitor them on an oscilloscope. 	<p>Schematic diagrams of: (I) half-wave rectifier (ii) full-wave rectifier. Graph sheets, oscilloscopes, capacitors, inductors, zener diodes and transistors, various transformers: (I) step up and (ii) step down.</p> <p>- Do –</p> <p>- Do –</p>
7-9	<p>4.8 Explain the difference between regulator and stabilizer.</p> <p>4.9 Explain Switched Mode Power supply; Theory of operation, and evaluate performance using a circuit diagram.</p> <p>4.10 Distinguish between linear power supply and switched mode power supply</p>	<ul style="list-style-type: none"> • Explain the function of a regulator and a stabilizer in a power supply unit. • Show Linear power supply smps • Illustrate the concept of design of simple power supply unit, 	<p>Linear Power supply and smps</p> <p>Simple circuits presented</p> <p>.</p>

Week	General Objective: 5.0 Know the basic Principles of design of simple electronic circuits		
	Specific Learning Objective:	Teacher's Activities	Resources
		•	
Week	General Objective: 6.0 Know the Operation of Common Oscillator Circuits		
	Specific Learning Objective	Teacher's Activities	Resources
	6.1 Explain concept of Oscillation 6.2 Draw the diagram and explain the operation of the following oscillators. a) L.C. Oscillator Hartley Oscillator b) Colpits Oscillator – Crystal control Oscillator c) Tuned Mode Oscillator – Tuned Grid Oscillator d) R.C. Oscillators e) Multivibrators 6.3 Identify the frequency of an oscillator as the channel frequency of a TV or Radio station. Examples of TV and Radio tuners and their Operation. Define and explain: Astable Multivibrator Bistable Multivibrator Monostable Multivibrator.	<ul style="list-style-type: none"> • Demonstrate the concept of Oscillation using Stone in meter medium, using fork, string and wind instruments. * Demonstrate using switches and electric bulbs the operation of a distable multivibrator and observe the output from the scope. • Illustrate the circuit diagram of various Multivibrators and explain why they are so-called. • Provide examples of radio and TV tuners. • State the applications of multivibrators • Supervise the construction of a multivibrator Circuit (flip-flop). 	Stone and water bowl, Turning fork, guitar, etc. circuit diagrams of oscillator, Hartley, Colpitt, Crystal controlled, tuned and tuned grid, signal generator. Switches, bulb, Connecting leads & oscilloscope. Circuit diagrams. Power supply, transistors, resistors, capacitors, visual boards, connecting leads, soldering iron and lead.

Week	General Objective: 7.0 Know the use of Binary numbers and Logic Elements		
	Specific Learning Objective	Teacher's Activities	Resources
5-6	Explain the use of binary number in electronic circuits. Identify simple logic circuit of AND OR NOT	<ul style="list-style-type: none"> • Introduce binary and logic concepts and their application to electronics circuits. • Students to connect up logic gates to illustrate the following functions: <ul style="list-style-type: none"> (I) AND, (II) OR and (III) NOT gates • Write the truth tables for AND, OR and NOT gates 	Symbols and diagrams of logic circuits Logic gate symbols truth table for the logic gates mentioned. Logic gates modules

Week	General Objective: 8.0 Understand the Principles of Modulation and Detection		
	Specific Learning Objective	Teacher's Activities	Resources
7-9	8.1 Explain the principles of modulation and demodulation. 8.2 Explain the purposes of modulation and demodulation. 8.3 Draw the modulation envelop. 8.4 Identify demodulation circuits in AM radio sets. 8.5 Identify demodulation and Modulation circuits, in F.M. radio sets. 8.6 Explain how signals are detected.	<ul style="list-style-type: none"> • Define modulation and Demodulation and explain the principles of modulation. • Discuss the need for and the effects of amplitudes and frequency modulation for long distance broadcasting. • Sketch diagrams of modulated waves to illustrate the concept of modulation and demodulation as applied F.M. and AM systems. • Dismantle an AM radio set and identify. <ul style="list-style-type: none"> (i) Demodulation circuit (ii) Mixer circuit • Dismantle an FM radio set and identify <ul style="list-style-type: none"> (i) Demodulation circuit (ii) Modulation circuit (mixer) • Discuss how signals are detected in <ul style="list-style-type: none"> (I) AM receiver, and (II) FM receiver 	<ol style="list-style-type: none"> 1. Charts showing modulation and demodulated envelopes. 2. FM & AM R.F. signal generator, oscilloscope, signal tracer 3. AM Radio receiver, set of screwdrivers. 4. FM Radio receiver, set of screw drivers 5. Schematic diagrams. 6. Demodulated envelope. 7. Am and Fm trainers 8. Oscilloscope.

WEEK	General Objective: 9.0 Know the various Acoustics Devices/Equipment		
	Specific Learning Objectives:	Teacher's Activities	Resources
10-13	<p>Acoustics</p> <p>9.1 Explain basic working principles of :</p> <ul style="list-style-type: none"> (i) Loud speaker (ii) Microphone (iii) Tape recorder (iv) Turntable (v) Pick up (vi) Public address System (vii) Compact Disc (viii) Video Cassette Recorder (VCR) <p>9.2 Set up and operate a public address system.</p> <p>9.3 Troubleshoot and repair faulty P.A.S.</p>	<ul style="list-style-type: none"> • Identify the circuit symbols for the acoustic devices mentioned and state the function performed by each. • Discuss the working principles of these devices. • Set up a Public address system incorporating microphones, amplifiers turntable and loudspeaker, with stabilized power supply source. • Teachers are to alert students about risk of laser rays on functional compact disc players. 	<ol style="list-style-type: none"> 1. Loudspeaker, microphone tape recorder, turntable, pick up, PAS, Compact, disc, VCR, charts. 2. Microphones, Amplifier turntable and loudspeaker. 3. Fault PAS Equipment.

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER MAINTENANCE CRAFT PRACTICE.			
COURSE: CRT 12 ELECTRONIC DEVICES AND CIRCUITS		Course Code: CRT 12	Contact Hours: 3-2 Year 2, Term 1
Course Specification : Practical Content			
Week	General Objective: Specific Learning Objectives:	Teachers Activities	Resources
1-4	Effect of filter elements on D.C. output voltage for full wave rectifiers on ripples	<ul style="list-style-type: none"> ◆ Guide students in setting up Rectifier circuits. ◆ Guide students to build simple smoothing circuit and apply it to the output of the rectifier circuits. ◆ Let the student build up simple smoothing/filtering circuit and apply it to the output of the rectifier circuits ◆ 	
8-10	Construction and application of solid state devices	<ul style="list-style-type: none"> ◆ Set up laboratory experiment to plot characteristics of transistor 	
11	Identify and test the various types of semiconductor device: - Transistor Identify and test diode bipolar transistor terminals.	<ul style="list-style-type: none"> • Use meters to identify the types of Transistors P.N.P. and N.P.N. • Use meter to identify the base, emitter and collector and transistor condition. 	3 Tests meters Transistor tester, Transistor manual several transistors.
12-13	Use the Ohmmeter to test semi-conductor devices e.g. unijunction, FET, Thyristor	<ul style="list-style-type: none"> • Show how to use the The multimeter to test device, transistors etc. 	4 Multimeter FET & Unijunction Thyristor

9-13	<p>Electronic Project</p> <p>Students to perform Soldering/desoldering exercises on electronic circuit boards.</p> <p>Students to construct electronic project., e.g. stabilized Power supply, alarms, AF Ampliers, etc</p>	<ul style="list-style-type: none"> • Provide full construction information including circuit parts list, printed circuit board details, sheet metal details, etc. • Demonstrate various soldering/desoldering techniques. 	<p>Project Compartments Soldering iron, lead, Pcb, Veroboard, desoldering tool.</p>
	6.5 Students to construct signal injector	<p>◆ Construct a signal injector using a multi-vibrator circuit (flips flop).</p>	
7-9	Explain how signals are detected by using schematic diagrams	<p>◆ Using AM and FM trainers observe waveforms using an oscilloscope.</p>	

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER CRAFT STUDIES.		
MODULE: INTRODUCTION TO COMPUTERS	MODULE CODE: CCS 10	TOTAL CONTACT HOURS: 120Hrs
GOAL: To introduce the student to the equipment used for electronic data processing.		
GENERAL OBJECTIVES.		
On completion of this course, the student should be able to:		
1.0 Define Computer and know its classifications.		
2.0 Understand the impact and role of computers in modern society.		
3.0 Know the hardware and software elements of a computer.		
4.0 Understand the EDP Environment.		
5.0 Know the importance of security within computer environments.		
6.0 Know data/file security and control		
7.0 Understand the basic principles of Data Transmission.		
8.0 Know how to use the keyboard		

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER CRAFT STUDIES			
Module: INTRODUCTION TO COMPUTERS.		Module Code: CCS 10	Contact Hour/Wk: 2 Hrs Theory/3 Hrs Practical/2 Terms
Module Specification: Theoretical/Practical Content.			
WEEK	General Objective: 1.0 Define computer and know its classifications.		
	Specific Learning Outcome	Teacher Activities	Learning Resources
	Development of Computers. 1.1 Define a computer in relation to data and information. 1.2 Explain types of computer. 1.3 Classify computers according to: (a) usage; and, (b) size. 1.4 Distinguish between analog, digital and hybrid computers. 1.5 Identify the various types of microcomputers.	<ul style="list-style-type: none"> • Explain the concept of computer in relation to data and information. • Identify types of computers. • List and explain the classes of computers according to usage and sizes. • Differentiate between the various types of computers listed in 1.4 • Explain the various types of microcomputers. 	<ul style="list-style-type: none"> • Magic board • Charts/Posters • Sets of computers.
	2.0 Understand the impact and role of computers in modern society.		
	Role of computer in modern society. 2.1 List the uses of computers in our society. 2.2 Explain the social implications of computers on society.	<ul style="list-style-type: none"> • Identify the principal uses of computers. • Discuss the social implications of computers on the society. 	- Do -
	2.3 List the characteristics and benefits of computer to the society. 2.4 Explain the various applications of computer in everyday life in modern society.	<ul style="list-style-type: none"> • Using question and answer technique, state the advantages of computers to the society and explain the various areas of applications. 	

3.0 Know computer hardware and software elements of a computer.			
3.1 Explain the constituent parts of computer. 3.2 Identify computer hardware. 3.3 Explain the various hard wares available and their functions.	<ul style="list-style-type: none"> Name and describe the parts of a computer. Identify the various hard wares and explain their functions. 	<ul style="list-style-type: none"> Pictures/Posters. Set of computer. Magic board. Lesson note, etc. 	
3.4 Describe computer hardware configuration. 3.5 List some input units. 3.6 Describe the functions of the output units. 3.7 Describe the functions of the CPU. 3.8 List some auxiliary units. 3.9 Describe the functions of the auxiliary memory. 3.10 Define: nibbles, bytes, word, storage size in terms of 'k'.	<ul style="list-style-type: none"> Explain computer configuration. Identify input units Explain the functions of the output unit. State the functions of the CPU. Identify and explain 'auxiliary unit'. Explain the functions of auxiliary memory. Explain the items in 3.9. Give notes. 	- Do -	
3.11 Define software 3.12 List various types of softwares 3.13 Distinguish between low and high level languages 3.14 Define source and object codes. 3.15 Define a translator. 3.16 Describe different types of translator: assembler; compiler; interpreters.	<ul style="list-style-type: none"> Differentiate between system and application softwares Explain the difference between high and low level languages. Identify source and object codes Explain Translator and show examples. <p>Identify different types of translators: assemblers, compilers and interpreters.</p>		

4.0 Understand the EDP Environment		
<p>EDP Environment.</p> <p>4.1 Describe organisational structure of an EDP Environment</p> <p>4.2 Explain the concept of computer systems.</p> <p>4.3 Define information and explain the concept of information technology.</p> <p>4.4 Define computer files.</p> <p>4.5 Explain the purpose of computer files.</p> <p>4.6 Describe the elements of a file.</p> <p>4.7 List and explain types of files.</p> <p>4.8 Explain file organization methods.</p> <p>4.9 Explain File Access Methods</p> <p>4.10 Explain storage media devices.</p> <p>4.11 Describe processing activities.</p> <p>4.12 Explain vulnerability of files:</p> <p>(i) Improper/fraudulent input</p> <p>(ii) Software/programme abuse</p>	<ul style="list-style-type: none"> • Explain the Organogram of an EDP environment. • Discuss the concept of computers. • Using question and answer technique, explain information and the concept of information technology. • Define ‘computer file’ and explain its purpose; characteristics; types and organisation. • Describe sequential, random and direct access methods. • Describe storage media devices and state their functions. • Explain processing activities and give examples. • Discuss the vulnerability of files. • Ask questions and give note to student. 	<p>- do -</p>
5.0 Know the importance of security within the computer environment.		
<p>5.1 Explain data control techniques.</p> <p>5.2 Identify and explain standard operating procedures of a computer installation.</p>	<ul style="list-style-type: none"> • Describe data control technique. • List and explain standard operating procedures of a computer installation. 	<p>-do-</p>

<p>5.3 Explain the need for computer room security.</p> <p>5.4 Identify and describe computer systems auditing.</p> <p>5.5 Explain prevailing safety regulations in computer installation.</p> <p>5.6 Describe methods of preventing hazards (fire, flooding, sabotage, etc).</p>	<ul style="list-style-type: none"> • State the need for computer security in the computer room. • Explain computer auditing. • Explain the various safety regulations applicable to computer installation. • Enumerate methods whereby hazards could be prevented in computer room. 	
6.0 Know Data/File Securities and Control.		
<p>Data/File Security</p> <p>6.1 Explain Data security and control</p> <p style="padding-left: 20px;">(i) Manual Control</p> <p style="padding-left: 20px;">(ii) Data preparation control</p> <p style="padding-left: 20px;">(iii) Validation checks</p> <p>6.2 Explain file security and control</p> <p style="padding-left: 20px;">(i) Describe file security methods in computer installations.</p> <p style="padding-left: 20px;">(ii) Explain the need for file security in computer installation.</p> <p style="padding-left: 20px;">(iii) Explain the user password and user names.</p> <p>6.3 Explain computer virus.</p> <p>6.4 State the various sources of viruses.</p> <p>6.5 Describe ways of getting rid of computer virus.</p>	<ul style="list-style-type: none"> • Use question and answer • List methods of file security in computer installation and explain the need for file security in computer installation. • Define ‘user password’ and ‘user name’. • Describe computer virus and identify: <ul style="list-style-type: none"> (i) their possible sources. (ii) Ways of getting rid of them. (iii) Ways of preventing the computer from contaminating viruses. 	<ul style="list-style-type: none"> • Lesson note • Chalkboard

7.0 Understand the basic principles of Data Transmission.		
Principles of Data Transmission		
7.1 Define data transmission.	<ul style="list-style-type: none"> • Explain data transmission. • Explain the term 'telecommunication'. • Define Network • Explain the differences between LAN and WAN • Discuss the advantages of Network. 	- do -
7.2 Explain the term telecommunication.		
7.3 State different methods of data transmission.		
7.4 Define computer Network.		
7.5 State types of Network		
7.6 State advantages of Network		
8.0 Know how to use Keyboard		
8.1 Understand the use of keyboard.	<ul style="list-style-type: none"> • Show and explain items in 8.1 • Give a typing assignments 	<ul style="list-style-type: none"> • Computer software e.g. typing Tutor.
<ul style="list-style-type: none"> (i) Function Keys (ii) Alphanumeric Keys (iii) Numeric Keys (iv) Control Keys 		
8.2 Practice typing on the Keyboard		

NATIONAL TECHNICAL CERTIFICATE IN COMPUTER MAINTENANCE PRACTICE

Course Title: COMPUTER SYSTEM MAINTENANCE I

Course Code:

Contact Hours:

Goal: This module is intended to provide the trainee with basic knowledge of Computer Maintenance and Upgrading

General Objective: On completion of this module, the trainee should be able to:

- 1.0 Understand the general overview of computer system.
- 2.0 Know the computer basic hardware maintenance tools and equipment.
- 3.0 Know the various types and specifications of Microprocessors.
- 4.0 Know the general features of Motherboard, the board slots, I/O devices and Interfaces.
- 5.0 Understand the features of memory modules.
- 6.0 Understand the sections of power supplies.
- 7.0 Understand preventive and corrective maintenance techniques
- 8.0 Know the maintenance and Installation of storage drives.
- 9.0 Understand the features and installation of simple communication networks.
- 10.0 Know the software and hardware diagnostic tools for troubleshooting.
- 11.0 Know how to upgrade computer system

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER MAINTENANCE PRACTICE			
Course:	Course Code	Year1, Term1	Contact Hour
Course Specification			
Theoretical Content			
Week	General Objective: 1.0 Understand the general overview of computer system and components.		
	Specific Learning Objective:	Teachers Activities	Resources
	Computer System and Components 1.1 Describe, with the aid of a block diagram, the computer hardware configuration. 1.2 Describe the input devices e.g. Keyboard, Mice, Joysticks, etc. and their functions. 1.3 Describe the Output devices e.g. Monitors (Visual Display Unit), Printers, Speakers, etc. their types and functions, etc. 1.4 Explain the functions of Storage devices e.g. hard disk.	<ul style="list-style-type: none"> • Demonstrate using block diagram, the computer hardware configuration. • Describe the input unit e.g. keyboard • Describe the output unit e.g. monitor (video Display), printer, Speakers, their types and functions. • Explain the function of storage media • Explain I/O device 	Computer Computer hardware Charts Keyboard, mice, joystick etc. Monitor printer speakers etc. Hard disk Floppy disk Flash disk
WEEK	General Objective: 2.0 Know the basic computer hardware maintenance tools and equipment.		
	Specific Learning Objective:	Teachers Activities	Resources
	Basic Maintenance Tools 2.1 Identify the various types and sizes of the	State the various types of sizes of the	Nut drivers, chip

	<p>following hand tools:</p> <ol style="list-style-type: none"> i. nut drivers ii. chip extractor/insertor iii. flashlight iv. tweezers v. magnifying lens vi. torx drivers vii. screw drivers viii. soldering iron ix. part grabber or hemostats x. Lead sucker <p>2.2 State the functions of 2.1 above</p> <p>2.3 Identify and state the functions of the following test equipment:</p> <ol style="list-style-type: none"> i. Multimeters ii. Logic probe and logic pulsers iii. Outlet tester iv. ICs chip tester v. Oscilloscope vi. Digital counter vii. Regulator (dc) power supply viii. Variable power (ac) supply 	<p>following hard tools.</p> <ol style="list-style-type: none"> i. nut drivers ii. chip extractor/insertor iii. flashlight iv. tweezers v. magnifying lens vi. torx drivers vii. screw drivers viii. soldering iron ix. lead sucker x. part grabber or hemostats <p>State the functions of 3.1 above.</p> <p>State the functions of the following test equipment:</p> <ol style="list-style-type: none"> i) ICs chip tester 	<p>extractor/insertor tweezer, torx drivers, Screw drivers, part grabber/thermostats.</p> <p>Multimeter logic probe/pulsor outlet tester</p> <p>ICs chip tester</p>
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	<p>2.4 Identify various cleaning aids:</p> <ul style="list-style-type: none"> i. standard cleaner(CDROM cleaner, Floppy disk cleaner) ii. contact cleaner/lubricant iii. dusters iv. vacuum cleaners i. brushes and swabs 	<p>Demonstrate appropriate use of various cleaning solutions:</p> <ul style="list-style-type: none"> i) Standard cleaner (CDRom Cleaner, Floppy disk cleaner) ii) Contact cleaner/lubricant iii) Dusters iv) Vacuum cleaners v) Brushes and swabs. 	<p>Cleaning solution, CD ROM cleaner, Floppy disk cleaner, dusters, Vacuum cleaner brushes and swabs.</p>
General Objective: 3.0 Know the various types and specifications of microprocessors.			
WEEK	Specific Learning Objectives:	Teachers Activities	Resources
	<p>Types and Specifications of Microprocessors</p> <p>3.1 Define Microprocessor.</p> <p>3.2 Describe the following essential features of a microprocessor:</p> <ul style="list-style-type: none"> i. Data bus ii. Internal register iii. Address bus iv. Processor speed rating <p>3.3 Describe various types of processor e.g. 8088, 80x86(x = 1, 2, 3, 4), Pentium etc.</p> <p>3.4 Describe the Math Coprocessor</p>	<p>Define microprocessors</p> <p>Explain the following essential features of a microprocessor:</p> <ul style="list-style-type: none"> i) Data bus ii) Internal register iii) Address bus ▪ Processor speed rating <p>Show various types of processors e.g. 8088, 80x86 (x=1,2,3,4), Pentium variety etc</p> <p>State other practical uses of microprocessors</p>	<p>Microprocessors (variety)</p> <p>Chalk board</p> <p>Mother board (Variety)</p>

General Objective: 4.0 Know the general features of Motherboard, the board slots, I/O devices and Interfaces.			
	Specific Learning Objective:	Teachers Activities	Resources
	4.1 Define Motherboard. 4.2 Explain the following selection criteria for motherboard: i. Processor ii. Processor sockets iii. Motherboard speed iv. Cache memory v. Bus type vi. BIOS vii. Form Factor viii. built-in Interfaces ix. Power management x. Motherboard chipset xi. Documentation 4.3 List and describe the Motherboard casing form factor. 4.4 Define system bus 4.5 Describe the following types of buses: i. Industry Standard Architecture (ISA) bus. ii. Micro Channel Architecture (MCA) bus. iii. Extended Industry Standard Architecture	Define motherboard Explain each of the following selection criteria for motherboard: i) Processor ii) Processor sockets iii) Motherboard speed iv) Cache memory v) Bus type vi) BIOS vii) Form Factor viii) Built-in Interfaces ix) Power management x) Motherboard chipset xi) Documentation Describe the motherboard form factor egg full tower, desktop, midtower et Show the following types of buses: Industry Standard Architecture (ISA) bus micro Channel bus Extended Industry Standard Architecture (EISA)	Chalk Board Mother board (Variety) Motherboards Chalkboards

	(EISA) bus. iv. Universal Serial Bus (USB) etc.	bus Universal Serial Bus (USB) etc.	
Week	General Objective: 5.0 Understand the features of memory modules.		
	Specific Learning Objective:	Teachers Activities	Resources
	Memory Modules 5.1 Define memory. 5.2 Distinguish between Read/Write Memory (RAM) and Read Only Memory 5.3 Identify the physical: <ul style="list-style-type: none"> i. RAM chips and ii. ROM chips 5.4 Identify the following RAM chips: <ul style="list-style-type: none"> i. Dual in-Line Package (DIP) ii. Single in-Line Memory Module(SIMM) iii. Dual in-Line Memory Module (DIMM) iv. Single in-Line Pinned Package (SIPP) 	Define memory Describe RAM and ROM Distinguish between Read/Write memory (RAM) and Read Only memory. Show physically: <ul style="list-style-type: none"> i) RAM Chips ii) ROM Chips Show the following RAM Chips <ul style="list-style-type: none"> i) Dual in-line package (DIP) ii) Single in-line memory module (SIMM) iii) Dual in-line memory module (DIMM) iv) Single in-line pinned package (SIPP) 	Assorted Memory chips (Variety) Motherboards

	<p>5.5 Explain the memory bank layout and position on the motherboard and memory card.</p> <p>5.6 Describe the selection and installation of memory Chips.</p>	<p>Show the memory bank layout and position on the motherboard and memory card</p> <p>Describe the selection criteria installation of memory chips.</p>	
Week	General Objectives: 6.0 Understand the Sections power supplies.		
	Specific Learning Objective:	Teachers Activities	Resources
	<p>Power Supplies</p> <p>6.1 Explain the power supply function and operation</p> <p>6.2 Describe the various power supply form factor</p> <p>6.3 Describe the power supply connectors</p> <p>6.4 Explain the power switch connector colour codes</p> <p>6.5 Explain the power supply ratings</p> <p>6.6 Identify various power protection devices:</p> <ol style="list-style-type: none"> i. Surge Suppressor (protector) ii. Standby Power Supply (SPS) iii. Line Conditioners iv. Uninterruptible Power Supplies(UPS) 	<p>Demonstrate trouble shooting power supply using test equipment.</p> <p>Identity various power protection devices:</p> <ol style="list-style-type: none"> i) Surge suppressor (protector) ii) Standby Power supply (SPS) iii) Line conditionals iv) Uninterruptible Power Supply (UPS) v) Automatic Voltage Regulator (AVR) 	<p>Computer power supplies</p> <p>Line conditioner</p>

GENERAL OBJECTIVES: 7.0 Understand preventive and Corrective Maintenance techniques			
	Specific Learning Objectives:	Teachers' Activities	Resources
	7.1 Define preventive maintenance 7.2 Describe the following preventive maintenance i) active preventive maintenance ii) passive preventive maintenance 7.3 Define corrective maintenance	Define preventive maintenance Describe the following preventive maintenance i) active preventive maintenance ii) passive preventive maintenance Define corrective maintenance	Chalk board Boards, Connectors and contacts, Key board and mouse.
8.0 Know the maintenance and Installation of storage devices			
	8.1 Identify various types of storage devices 8.2 Define hard disk and show the various capacities 8.3 Define hard disk 8.4 Explain the unit of measuring hard disk capacity, e.g. byte, Byte, Gbyte and Terabyte 8.5 Describe the following type of formatting and state the various types. i) Physical or low level ii) Logical in high level 8.6 Explain IDE drive jumper settings e.g. master, slave, single-drive	Show the various types of storage devices Explain the way and purpose of formatting and state the various types.	*Computer

	<p>8.7 Explain the following hard disk failure:</p> <ul style="list-style-type: none"> i) Incorrect drive select jumpers setting ii) Loose, damaged, or reversed control cable; iii) Loose or bad power cable; iv) Bad power supply; v) Incorrect drive-type setting etc <p>8.8 Identify various CD drives.</p> <p>8.9 Describe the tape backup drives</p>	<p>*Show the jumper setting on a drive and how to set them into different mode of operation</p> <ul style="list-style-type: none"> • Explain the effects of incorrect jump selection, look or cables, loose power cable. • Show types of CD Rom Drives. • Explain the type of secondary back up • Demonstrate the process of installing a type drive. • Guide students to install CD Rom Installation and configuration Rom a CD Rom based program e.g. audio CD, audio CD. 	<p>*Hard disk</p> <p>*Chalk board</p> <ul style="list-style-type: none"> • Hard disk • Computer • . <p>*Computer</p> <p>◆ Chalkboard</p> <p>Computer with CD drive</p>
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WEEK	General Objective: 9.0 Understand the feature & installation of simple comm. Networks		
	Specific Learning Outcome:	Teachers Activities	Resources
	Simple Communication Networks 9.1 Define Network 9.2 State types of Network e.g. LAN, WAN, INTERNET etc.	Define Network Describe types of Network e.g. LAN, WAN, INTERNET etc. Carry out field trip to an Internet Cafe	Chalk board Computers
	10.0 Know the software and hardware of diagnostic tools for troubleshooting		
	Diagnostic tools 10.1 Describe Post 10.2 Apply the operating system diagnostic software to carry out preventive maintenance. 10.3 Explain the following diagnostic softwares: i) Norton utilities ii) Antivirus software iii) Microscope etc.	Describe the power on self test (post). Demonstrate the use of operating system diagnostic software to carry out preventive maintenance. Demonstrate the use of Norton utilities, Antivirus software, microscope etc.	Computers various of Diagnostic software.

General Objective 11.0 Know how to upgrade computer system			
	11.1 Explain computer system upgrading	Reasons and limitation of upgrading	Chalkboard
	11.2 Explain the forms of upgrading: Processor Motherboard RAM	Explain different forms of upgrading	Chalkboard Upgraded and Un-upgraded Components
	11.3 Explain power supply upgrading	Mention reasons for power supply upgrading	Chalkboard Power supply variety

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER CRAFT STUDIES

MODULE: Computer System Maintenance I

Module Specification: Practical Content.

General Objective: 1.0 Define computer and know its classifications.			
	Specific Learning Outcome	Teacher Activities	Learning Resources
	6.7 Troubleshoot power supply and repair faults using test equipment tools.		
	7.1 Perform cleaning of: i) board ii) connectors and contacts iii) keyboard and mouse 7.2 Perform corrective maintenance of faulty boards	Demonstrate cleaning of: i) board ii) connectors and contacts iii) keyboard and mouse Demonstrate corrective maintenance of faulty board	
	8.1 Explain formatting of a disk using. i) DOS Format command ii) WINDOWS Format Command 8.2 Perform maintenance of floppy disks drives 8.3 Carry out system configuration of floppy disk drive for installation.	Demonstrate formatting on a floppy diskette on a computer. Explain and demonstrate technique of maintenance of during and stage of FDD. Demonstrate the stage of Disk Drive configuration & connections	*Computer *Diskette *Diskette <ul style="list-style-type: none"> • Disk storage • Disk drive cleaner • Computer • Computer • Hard disk

	<p>8.4 Perform the physical installation by connecting with cables.</p> <p>8.5 Carry out hard disk installation based on the following steps:</p> <ol style="list-style-type: none"> i) Configure the drive ii) Configure the controller iii) Physically install the drive iv) Configure the System v) Low level formatting the drive (if required) vi) partition the drive (using DOS, F-disk vii) (command) viii) High level format the drive. ix) Install the operating system <p>8.6 Perform CD Rom installation by the following sequence:</p> <ol style="list-style-type: none"> i) Drive configuration ii) Physical installation <p>Run a CD Rom based program</p>	<p>Explain hard disk and show the various capacities</p> <ul style="list-style-type: none"> • Show how to install a hard disk and configure system. Demonstrate the effect of way • Parameter setting • Demonstrate how to install on operating system (e.g window) on a hard disk. • Guide students to install CD Rom Installation and configuration Rom a CD Rom based program e.g audio CD, audio CD. 	<ul style="list-style-type: none"> • Chalk board • Computer • Notes • New HOD Hard disk. • Computer *Computer ◆ Chalkboard Computer with CD drive
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	<p>10.1 Use general purpose diagnostic programs</p> <ul style="list-style-type: none"> i) memory module ii) Floppy drive iii) Hard disk drive iv) Video board etc. <p>10.2 Use the following diagnostic softwares:</p> <ul style="list-style-type: none"> i) Norton utilities ii) Antivirus software iii) Microscope 	<p>Demonstrate the general purpose diagnostic programs for memory module, floppy drive, hard disk drive, video board etc.</p>	<p>Computers various of Diagnostic software.</p>

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GSM MAINTENANCE CRAFT PRACTICE

MODULE: DIGITAL COMPUTER ELECTRONICS

MODULE CODE:

CONTACT HOURS

GOAL: To provide the student with the basic understanding of the digital electronic.

GENERAL OBJECTIVES:

On completion of this course, the student should be able to:

- 1.0 Know the different number systems
- 2.0 Know fundamentals of Boolean algebra
- 3.0 Know computer logic gates
- 4.0 Know common digit system building blocks
- 5.0 Understand the nature and characteristics of digital ICs

Programme: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GSM		MAINTENANCE	
CRAFT PRACTICE			
Module:		Module Code:	Contact Hours:
Module Specification:			
Week	General Objective: 1.0 Know the different number systems		
1.	Specific Learning Objectives	Teacher/Student Activities:	Learning Resources
	<p>Number System</p> <p>1.1 Solve problems using decimal Binary, Octal and hexadecimal number systems</p> <p>1.2 Convert from one numbering system to another.</p> <p>1.3 State areas of application of the number systems.</p> <p>1.4 Explain BCD, XX3 code 7 segment display code</p>	<p>* Introduce decimal, binary octal and Hexadecimal number system with examples. Carry out simple arithmetic operations using the various number Systems.</p> <ul style="list-style-type: none"> • Convert decimal to binary numbers • Convert binary to octal and check. • Convert octal & hex to binary. • Convert octal & hex to decimal • Give the area of application of Number systems. <p>Define and describe what codes Explain conversion from one code to another Mention devices that make use of frequent display</p>	<p>Chalk board</p> <p>LCD</p>
Week	General Objective: 2.0 Know fundamentals of Boolean algebra		
	Specific Learning Objective	Teacher/Student Activities:	Learning Resources
	<p>2.1 Define the inverse (NOT), AND and the OR operations</p> <p>2.2 State Boolean postulates</p> <p>2.3 Define the laws of Boolean algebra Commutative Law, associative law Distributive law, negation law Redundancy law, and De Morgan's Law.</p>	<ul style="list-style-type: none"> • Show the AND OR & NOT Functions. • Show NOT, AND & OR operation • Using two bulbs, and a battery model. • State the Boolean equation of $A \times A = A$, $a + A = 0$ $A - A = 0$ etc. 	<p>Chalk board</p> <p>Chalk board Assembled board.</p>

General Objective: 3.0 Know Computer Logic gates			
Specific Learning Objective		Teacher/Student Activities:	Learning Resources
3.1 Define the basic logic gates NOT, AND OR 3.2 Draw the symbols of 3.1 above 3.3 Define the combination of logic Gates NAND, NOR, XOR, XNOR 3.4 Draw the symbols of 3.3 above 3.5 Explain Truth Tables. 3.6 Design simple circuits using logic Gates		<ul style="list-style-type: none"> • Show the symbols of a 2-input NAND & OR gates and a NOT Gate. • Show the NAND, NOR XOR XNOR representation. • Explain Truth Table • Show the truth table for 2-input AND & OR gates and a NOT gate. • Show the realization of simple logical expressions. 	Chalk board Chalk board
General Objective: 4.0 Know Common Digital System Building Blocks			
Specific Learning Objective		Teacher/Student Activities:	Learning Resources
4.1 Explain combinational and sequential logic 4.2 Define the RS latch as a basic memory cell. 4.3 Explain the operation of flip-flops 4.4 Explain the following flip-flops i) D flip – flop ii) T-flip – flop iii) JK-flip-flop		<ul style="list-style-type: none"> • Differentiate between combinational logic and sequential logic. • Show how a latch is realized from logic gates and its truth-table. • Show how a flip is realized from logic gates. • Define edge triggering and state the functions of D, T & JK flip-flops 	Chalk board Logic module
General Objective: 5.0 Know the nature and characteristics of digital ICs.			
Specific Learning Objective		Teacher/Student Activities:	Learning Resources

	<p>5.1 Explain the action of a diode as a Switch.</p> <p>5.2 Explain the action of a bipolar transistor as a switch.</p> <p>5.3 Distinguish between digital and analogue ICs.</p> <p>5.4 State the logic families</p> <p>5.5 Explain the constructional features of TTL ICs.</p> <p>5.6 State the TTL numbering schemes.</p> <p>5.7 State the operational characteristics (Power ratings, voltage ratings etc.) of TTL devices.</p> <p>5.8 Explain the constructional features of CMOS ICs.</p> <p>5.9 State CMOS numbering schemes</p> <p>5.10 Explain operational characteristics of CMOS devices.</p> <p>5.11 Explain IC pin numbering and layout:</p> <p>i) Dual in line (DIL)</p> <p>ii) Flat Pack</p> <p>iii) Pin Grid Array.</p>	<ul style="list-style-type: none"> • Show a circuit of a diode and transistor connection as switch • Give examples of digital and analogue IC's. • Explain the various digital IC logic families • Show the constructional features of TTL IC's and their numbering. <ul style="list-style-type: none"> • Explain the characteristics of the TTL devices • Show the constructional features of CMOS and their numbering • Explain the characteristic of the (MOS devices • Show the various IC pin layout and numbering systems. 	<p>Chalk board</p> <p>Chalkboard TTL IC's</p> <p>Chalkboard TTL data sheets</p> <p>Chalkboard CMOS data book</p> <p>Chalkboard Note Digital IC data sheets.</p>
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**PROGRAMME: ADVANCED NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GSM
MAINTENANCE CRAFT PRACTICE**

MODULE: COMPUTER SYSTEMS MAINTENANCE II

MODULE CODE:

MODULE SPECIFICATION:

GENERAL OBJECTIVES:

- 1.0 Know the techniques of building a computer system
- 2.0 Know the general features fault – finding and repairs of a typical power supply unit
- 3.0 Know the general features, fault – finding and repairs of a typical VDU (monitor).
- 4.0 Know the principles of operation of printer
- 5.0 Know more about Motherboard and memory resources.

PROGRAMME: ADVANCED NATIONAL TECHNICAL CERTIFICATE IN COMPUTER MAINTENANCE CRAFT PRACTICE.			
COURSE: COMPUTER SYSTEM MAINTENANCE II		Course Code:	Contact Hours:
Course Specification:			
Week	General Objective: 1.0 Know the techniques of building a Computer System		
	Specific Learning Objectives	Teachers' Activities	Resources
	1.1 State the various components in a system unit. 1.2 Explain the process of assembling a computer system	*Show and explain various components in a system Unit. - Explain the safety measures in assembling a computer system	Internal components of a computer. Chalkboard Chart
	General Objective: 2.0 Know the general features operation, fault –finding and repairs of a typical Power Supply Unit		
	Specific Learning Objectives	Teachers Activities	Resources
	2.1 Explain the principle of a switching mode Power Supply Unit (SMPS). 2.2 State power ratings of typical PSU 2.3 Identify various parts of a PSU: i) protective fuses and radio frequency filters	- Explain the operation of a switching mode (SMPS) Open show and identify various panda of a PS pack	PS pack PS pack

	<ul style="list-style-type: none"> ii) rectifiers and filters iii) higher frequency switch iv) step-down switching transformer v) low voltage rectifier and filters vi) control circuit. 	Carry out some repair work on the PSU	PS pack
General Objective: 3.0 Know the general features, and operation of Visual Display Unit (Monitor)			
	Specific Learning Objective	Teachers Activities	Resources
	3.1 Explain the principles of operation of CRT 3.2 Explain the followings: <ul style="list-style-type: none"> a. HV generator. b. Focus c. Synchronization circuits. 3.3 Explain video amplifier, Colour video and composite video. 3.4 Identifying the following in a typical VDU: CRT, deflection system, EHT transformer, RGB video amplifiers, Sync. Circuits, power supply and input connector. 3.5 State the pins of a typical VDU and their functions.	Describe raster scan Describe CRT, raster e.t.c - do - Open the VDU and explain.	Chalkboard Chalkboard Chalkboard VDU - do -
General Objective: 4.0 Know the principles of operation of printers			
	Specific Learning Objective	Teachers Activities	Resources
	4.1 Explain the principles of operation of printers 4.2 Explain the types of printers, e.g. Laser, Dot-matrix, Inkjet, etc. 4.3 Identify various parts of a printer	Highlight advantages of various types of printers Guide students to	Chalk Chart
General Objective: 5.0 know more about Motherboard and memory resources			
	Specific Learning Objective	Teachers Activities	Resources
	5.1 Describe the following system resources, interrupt request channel, direct memory access, IO port address		

	<p>5.2 Explain the following system memory layout: Base Memory Upper Memory Area (UPA) Higher Memory Area (HMA) Extended Memory Area (XMA) Expanded Memory Area</p> <p>5.3 Explain the parity checking techniques: i. Odd parity ii. Even parity</p>		
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PRACTICAL CONTENT COMPUTER MAINTENANCE II			
General Objective: 1.0 Know how to install computer system			
	Specific Learning Objective	Teachers Activities	Resources
	1.1 Assemble and disassemble a system Unit comprising: i) mother board ii) processor iii) FDD iv) HOD v) Casing and PSU 1.2 Assemble a complete computer system by integrating system Unit, keyboard, mouse and monitor 1.3 Configure the assembled system 1.4 Install and run an operating system 1.5 Display and print specification of the system.	Demonstrate how to carry out assembly of a system unit. - do - - Describe how to load and run the system.	Monitor Keyboard - do -
General Objective: 2.0 Know how to carry out fault finding and repairs of Power supply			
	Specific Learning Objective	Teachers Activities	Resources
	2.1 Demonstrate fault finding and repairs of switching mode power supply 2.2 Repair of faulty PSU.		
General Objective: 3.0 Know how to carry out fault-finding and repairs in VDU			
	Specific Learning Objective	Teachers Activities	Resources
	3.1 Demonstrate preventive maintenance of VDU 3.2 Demonstrate fault-finding and repairs in VDU.		
General Objective: 4.0 Know how to carry out fault finding and repairs of printer			
	Specific Learning Objective	Teachers Activities	Resources
	4.1 Demonstrate preventive maintenance of printer 4.2 Demonstrate fault finding and repairs in printer		

**PROGRAMME: ADVANCED NATIONAL TECHNICAL CERTIFICATE IN COMPUTER MAINTENANCE
 AND CRAFT PRACTICE**

MODULE: INTRODUCTION TO COMPUTER NETWORKS Module Code: Contact Hours

Module Specification: Theory/Practical

GOAL: To introduce the student to the understanding and use of Computer Networks.

General Objectives:

On completion of this module, the student should be able to:

- 1.0 Understand the meaning and needs for Computer Networks
- 2.0 Know the types of Computer Networks
- 3.0 Know the various Network components and their uses
- 4.0 Know Network cables and their uses
- 5.0 Understand the process of building simple Computer Networks
- 6.0 Know the uses of the Internet.

Week	General Objective: 1.0 Understand the meaning and need for Computer networks		
	Specific Learning Outcome	Teachers Activities	Resources
	1.1 Define Computer Network 1.2 Explain the needs for Computer Networks 1.3 Explain the various areas where Computer Networks can be used e.g banks, business organizations etc.	Explain Computer Networks. Illustrate with diagrams how computers can be connected together	<ul style="list-style-type: none"> • chalkboard • Diagrams showing systems connected together.
	General Objective: 2.0 Know the types of Computer Networks		
	2.1 Explain the following Computer Network configurations. <ol style="list-style-type: none"> i. Local Area Networks (LAN) ii. Metropolitan Area Network (MAN) iii Wide Area Networks (WAN) 2.2 Distinguish between peer to peer and server based networks. 2.3 Explain Network topologies such as: <ol style="list-style-type: none"> (i) Star (ii) Bus (iii) Ring. 2.4 Explain the advantages and disadvantages of the topologies in 2.3 above.	Demonstrate with diagrams and explanations local and wide areas network. Distinguish in terms of distance coverage. Illustrate connection with diagrams. Illustrate with diagrams the different types of topologies. Clearly explain why one topology is preferred over the other.	<ul style="list-style-type: none"> • chalkboard • Diagrams. • Chalkboard • Chalkboard • Chalkboard
	General Objective: 3.0 Know the various Network components and their uses:		

	<p>3.1 Explain the meaning and uses of the following network components:</p> <ul style="list-style-type: none"> i) Nodes ii) Network Interface cards iii) Hubs iv) Switches v) Bridges vi) Repeaters vii) Routers viii) PC adapter cards 	<p>Explain clearly the use of each network components in a network.</p>	<ul style="list-style-type: none"> • Chalkboard • Various network components.
<p>General Objective: 4.0 Know Network cables and their uses</p>			
	<p>4.1 Explain the common Network cables such as:</p> <ul style="list-style-type: none"> i) Unshielded Twisted Pair (UTP) ii) Coaxial cable iii) Fibre Optics <p>4.2 Explain types of cable</p>	<p>Show students the types of cables used in networks. Explain the situations where they are used.</p> <p>Explain the difference between the various cable categories and when they are used.</p> <p>Explain types of cable connectors</p>	<ul style="list-style-type: none"> * UTP cables * Coaxial cable *Chalkboard * RJ45 connector * BNC connectors
<p>General Objectives: 5.0 Understand the process of building simple Computer Network</p>			
	<p>5.1 Explain the minimum components required to build a simple Computer Network</p> <p>5.2 Explain the concept of valid and invalid networks.</p> <p>5.3 Explain the effect of the following on network performance:</p> <ul style="list-style-type: none"> i) Cabling ii) Count iii) Distance 	<p>Explain clearly the basic components that can form a network</p> <p>Explain how many nodes can be connected to a hub and the longest distances possible.</p> <p>Explain how count, cable and distance affect network performance.</p>	<ul style="list-style-type: none"> ➤ Computers ➤ Cables ➤ Hub

General Objective: 6.0 Know the use of the Internet			
	<p>6.1 Explain the use of the Internet and its applications</p> <p>6.2 Explain the following terms:</p> <ul style="list-style-type: none"> ➤ World Wide Web ➤ Internet Protocol, e.g. http, tcp/ip, etc ➤ Internet Address 	<p>Explain clearly the use of internet in communication.</p> <p>Explain with examples</p>	<ul style="list-style-type: none"> ➤ Computers connected to the internet. ➤ Chalkboard ➤ Chalk

PRACTICAL CONTENT COMPUTER NETWORKS			
	General Objective:		
	Specific Learning Objective	Teachers Activities	Resources
	1.0 Know how to construct simple Computer Networks		
	1.1 Demonstrate Network cable terminations and splicing 1.2 Demonstrate how to build a simple Computer Network		
	5.1 Demonstrate how to couple a simple network using three computers and a hub.	Do a practical connection of the systems to form a network and power it	<ul style="list-style-type: none"> ➤ Computers ➤ Cables ➤ Hub
	6.0 Know how to use the Internet		
	6.1 Demonstrate how to use Internet facilities to send messages and obtain information	Field trip to browse	Internet Cafe

PROGRAMME: ADVANCED NATIONAL TECHNICAL CERTIFICATE IN COMPUTER CRAFT STUDIES

MODULE: COMPUTER APPLICATION PACKAGES MODULE CODE: CONTACT HOURS:

GOAL: To introduce the student to the use of computer packages

General Objectives

On completion of this course, the student should be able to:

- 1.0 Know common application packages.**
- 2.0 Understand word processing packages.
- 3.0 Know spread sheet packages.
- 4.0 Know statistical and graphics packages.
- 5.0 Know Database application packages.

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER CRAFT STUDIES			
MODULE: COMPUTER APPLICATION PACKAGES		Module Code:	Contact Hours:
Module Specification: Theoretical /Practical			
Week	General Objective: 1.0 Know common application packages.		
	Specific Learning Objective	Teacher Activities	Learning Resources
	<p>Application Packages</p> <p>1.1 Explain application packages.</p> <p>1.2 List common packages: word processing, spread sheet, Database Management System (DBMS), statistical, graphics, and expert system.</p> <p>1.3 Name some packages in each type listed in 1.2 above.</p> <p>1.4 Differentiate among system software, program generators and application packages.</p> <p>1.5 Identify the modes of acquisition of packages: in-house, purchase, lease, etc.</p> <p>1.6 State the criteria for packages acceptability: good documentation, user-friendliness, efficiency, appropriateness, etc.</p>	<ul style="list-style-type: none"> • Outline and explain the various types of application packages, e.g. word processing, spread sheet, database, etc. • List some specific features in each type of package listed above. • Explain the differences among system softwares, program generators and application packages. • Enumerate the various modes of acquisition of packages. • Outline and explain the criteria for packages acceptability. • 	<p>Computer System</p> <p>MS Office</p> <p>SPSS PC +</p> <p>Corel draw</p>
	2.0 Understand Word Processing Packages.		
	<p>Word Processing Package.</p> <p>2.1 Define Word processing packages.</p> <p>2.2 State the uses of word processing packages.</p>	<ul style="list-style-type: none"> • Define ‘word processing packages’ and state the uses 	<ul style="list-style-type: none"> • Computer • Chalkboard

<p>2.3 Explain menus.</p> <p>2.4 Explain how to:</p> <ul style="list-style-type: none"> ➤ Use main menu ➤ Choose command ➤ Select text and graphics ➤ Perform text input and editing ➤ Find, replace and format text ➤ Locate specific place in a document <p>2.5 Explain how to</p> <ul style="list-style-type: none"> ➤ :reuse text and graphics ➤ Compare Auto-Correct and Auto-Text ➤ Insert Text and graphics by using: (i) Auto-Correct and (ii) Auto-Text. <p>2.6 Explain document editing:</p> <ul style="list-style-type: none"> ➤ Check spellings and grammar ➤ Look up words in the Thesaurus. <p>2.7 Format Character and Paragraph:</p> <ul style="list-style-type: none"> ➤ Change Font, Font size and other Formats ➤ Change the Preset (Default) Character and Format paragraph ➤ Perform Centring, Alignment and Indenting of Text ➤ Set and clear Tab stops; line spacing and perform adding of Borders and Shading. 	<ul style="list-style-type: none"> • Explain the term ‘menu’. • Explain the use of the main menu. • Show the student how to choose and select command, text and graphics. • Demonstrate text input, editing, find, replace and formatting operations. • Show how to locate a specific place in a document. • Outline the comparison between auto correct and auto-text. • Use auto-correct and auto-text to insert text and graphics. • Demonstrate spellings and grammar check operations and how to look up words in the Thesaurus. • Show how to change font, font size and other formats and perform preset character and format paragraphs. • Show centring, alignment and indenting of text and set/clear tab stop, line spacing, add borders and shading. <p>68</p>	
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2.8 Explain How to:

- Sort List and Format Automatically.
- Create a Bulleted or Numbered List.
- Modify List Format, Number heading and Sort a List.
- Format Text automatically
- Modify Formats and create new styles.

2.9 Explain Document Templates, Design and Layout Page.

- Modify and create templates
- .Set up a new document, set paper size and page orientation and create header and footers.
- Number pages, lines and align text vertically on pages and divide document into sections and adjust paginate.

2.10 Explain Tables

- Create, modify and format a table.
- Sort and number cells and perform other special tasks with tables.
- Create a Form and fill in an online Form.

2.11 Text and Graphics with Frames.

- Align a Frame with a reference point and Format Text within it.
- Apply Border and Shading to the contents of a Frame and wrap around.
- Import and Edit Graphics.
Perform drawing in Word.

- Demonstrate and guide how to create (a) bulleted or numbered lists; (b) modify list format; (c) number heading and sort list; (d) format text automatically; (e) modify format and create new styles.
- Show how to: (a) modify and create templates; (b) set up a new document; (c) set paper size and page orientation; (e) create headers and footers.
- Explain how to number pages and lines align texts vertically on page and divide document into sections and adjust pagination.
- Demonstrate sorting and numbering of cells and other tasks with tables.
- Demonstrate the process of creating a form and filling in, and online form.
- Explain and demonstrate how to align a frame with a reference point and format text within it. ...

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2.12 Footnotes, Endnotes and Document Printing.

- Perform Outlining, Formatting and Numbering, Heading in Outline.
- Search, View and Edit Footnotes and Notes.
- Customize Footnotes and Endnotes.
- Make Cross Reference and Captions
- Index Tables of contents and Table of Figures.
- Save, Restore lost work and protect Document from changes.
- Perform previewing task, print documents, envelopes and labels.

- Identify Desktop Publishing functions of professional Word Processing package.

2.13 Explain how to mail merge

- Explain Mail Merge
- Create Primary and secondary file
- Perform mail merging of the two files

- Demonstrate border and shading to the contents of a frame.
and wrap around
- Show how to import and edit graphics
- Show to draw in Word.
- Guide students to perform the above tasks

- Demonstrate how to perform the functions listed in performance objectives 2.31 to 2.37.
- Guide the students to perform similar operations.
- List and explain the desktop publishing functions of professional Word Processing Packages

- List and explain Desktop Publishing functions of professional Word Processing package

3.0 Know Spread Sheet (Microsoft Excel).		
<p>3.1 Spread Sheet.</p> <ul style="list-style-type: none"> • Define a Spread Sheet. • Name the different types of Spread Sheet packages. • Explain the various areas of application of the spreadsheet. • Open the worksheet environment. • Explain the functions of the mouse pointer. • Explain tool bars and state their functions. <p>3.2 Edit a Worksheet</p> <ul style="list-style-type: none"> • Copy and paste text/document. • Insert rows and columns. • Edit text in a cell; and, delete texts from a cell. • Expand and reduce rows and columns. <p>3.3 Explain how to edit a worksheet</p> <ul style="list-style-type: none"> • Link cells and worksheets. • Create a document using formula and insert the data. • Insert the formula for calculating data. • Use the summation tool. 	<ul style="list-style-type: none"> • Define spreadsheet and list the different types of Spreadsheet packages available. • Identify the various areas of application of Spread Sheet. • Show how to open the worksheet environment and explain the functions of mouse and tool bars. • Demonstrate the various editing operations on a Worksheet and guide the student to carry out similar operations. 	<p>Chalkboard Ms Office (Excel)</p> <ul style="list-style-type: none"> • Computer sets • Lesson note <p>Chalkboard, etc.</p>

<p>3.4 Explain how to edit and Create a payroll.</p> <p>3.5 Choose type and category of graph.</p> <p>3.6 Create and print graph.</p> <p>3.7 Format a worksheet (number, date, currency format).</p> <ul style="list-style-type: none"> ● Change paper format, set margin (Expand and reduce). <p>3.8 Merge cells; Insert borders; Align text; remove and insert gridlines.</p> <p>3.9 Customize the toolbar.</p> <ul style="list-style-type: none"> ● Save, name, and rename a worksheet. ● Choose printer, select print area and print document. 	<ul style="list-style-type: none"> ● 	<ul style="list-style-type: none"> ●
<p>4.0 Know Statistical and Graphics Packages.</p>		

	<p>Statistical and Graphics Packages</p> <p>4.1 Explain a statistical Packages.</p> <p>4.2 Apply a statistical package to solve a given problems.</p> <p>4.3 Explain graphic packages.</p> <p>4.4 Apply a graphic package to solve problems.</p>	<ul style="list-style-type: none"> • Define ‘statistical packages’ and explain their features, and types. • Demonstrate the use of statistical package to solve some given problems. • Define graphic package and state their features, types, and applications. • Demonstrate the use of graphic package to solve problems. • Give assignment to students on the application of statistical and graphic packages. 	-do-
Week	5.0 Know Database Application Package.		
	Specific Learning Objective	Teacher Activities	Learning Resources
	<p>5.1 Explain Database Application Package.</p> <ul style="list-style-type: none"> • Define Database Management System (DBMS). • List the different types of DBMS and state they are relational, hierarchical and network. • State the application of DBMS. 	<ul style="list-style-type: none"> • Explain what is Database Management System identifying the different types of DBMS and their applications. 	<ul style="list-style-type: none"> • Computer • Chalkboard • Lesson Note

<p>5.2 Explain the structure of Database</p> <ul style="list-style-type: none"> ● List; compare and contrast various DBMS packages. ● Explain the terms: - 'DATA', 'FIELD'. Records and files ● Classify data as alphabetic, numeric or alphanumeric. ● Run a database application package and database file for immediate access. 	<ul style="list-style-type: none"> ● Outline, compare, and contrast the various types of DBMS. ● Explain the terms: - 'DATA', 'FIELD'. and classify Records and files into alphabetic, numeric and alphanumeric ● Demonstrate how to run .database file for access. 	<ul style="list-style-type: none"> ● -do-
<p>5.3 Explain how to work with database files</p> <ul style="list-style-type: none"> ● Identify the field names of the record in a database file and the data type and length of a given field. ● Add a given record to an existing file. ● Display and edit selected fields. ● Explain the following: - file as a set of record; the fieldname; data type; and, length of any given field in a selected record from a database file. 	<ul style="list-style-type: none"> ● Explain and demonstrate how to identify field names of records in database. ● Demonstrate how to add a record, display and edit selected fields. ● Explain in detail the characteristics and features of a database file. 	<ul style="list-style-type: none"> ● -do-

	<p>5.4 Explain how to search for records</p> <ul style="list-style-type: none"> • Explain the terms: - ‘Fixed’ and ‘Variable’ length record; ‘MENU DRIVEN’ and ‘COMMAND DRIVEN’ software. • Explain a single condition search for a numeric and alphanumeric fields. • Explain a multiple condition search for a specified range of items. • Print a list of records matched by a single condition search. <p>5.5 Explain how to sort a file</p> <ul style="list-style-type: none"> • Explain a sort criterion for a specific field. • Sort the records on a specified field. • Print a sorted list of all records in the file. 	<ul style="list-style-type: none"> • Define the terms: ‘Fixed’ and ‘Variable’ length records; ‘menu driven’ and ‘command driven’ software; and explain a single and multiple condition search. • Demonstrate how to print a list of records matched by a single condition search. • Describe a sort criterion, and guide the students to sort records on a specific field and print a sorted list of records in the field. 	
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PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GSM MAINTENANCE CRAFT

MODULE: Global System of Mobile Communication (GSM) Maintenance and Repairs

DURATION:

GOAL: This module is aimed at providing the trainees with the basic knowledge of GSM Communication System: its operations and maintenance

GENERAL OBJECTIVES:

On completion of this module, the trainees, should be able to:

- 1.0 Know the basic principles of GSM communication system.
- 2.0 Know the different types of Mobile Phones, their features and the Service Providers in Nigeria.
- 3.0 Understand the essential components of GSM System and their functions
- 4.0 Understand the fault finding and repairs of GSM handsets

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GSM MAINTENANCE CRAFT			
Course: Global System of Mobile Communication (GSM) Maintenance and Repairs		Course Code:	Contact Hours
Course Specifications: Theoretical Contents			
WEEK	General Objective: 1.0: Know the basic operations of GSM communication system		
	Specific Learning Objectives	Teachers' Activities	Resources
	1.1 Explain the following terms: <ol style="list-style-type: none"> Wave Propagation Cellular GSM communication Repeater stations and CDMA communication Satellites Fibre optics 	Use charts to show geostationary and low-earth-orbit (LEO) Describe different types of wave propagation and their frequencies List the uses and limitations of the features	Chalkboard Charts Chalkboard
	1.2 List and explain the basic features of a mobile phone, e.g. SMS, GPS, WAP, GPRS, 3G, etc.		
General Objective: 2.0: Know the different types of Mobile Phones and the Service Providers in Nigeria			
	2.1 Explain the types of mobile phones in relation to their bandwidth	Give examples of different bandwidth of radio spectrum, e.g. VLF, LF, MF, HF, VHF, SHF (Microwave), etc. and show where the GSM system is located	GSM handsets Chalkboard Charts
	2.2 List and explain different types of a mobile phone (straight, flip and slides)	Show various types of mobile phones using objects and pictures	Handsets
	2.3 List and explain the functions of different types of mobile phone accessories	Show various types of mobile phones accessories	Charts Accessories

	2.4 Explain the main menu and submenu functions of different mobile phones, e.g. Phone Book, Message, Call Register, etc.	Operate different handsets to compare their menu functions	Charts Various Handsets
	2.5 Identify the major Service Providers in Nigeria and their service codes, e.g. Customer Service, Checking Balance, Recharging, Message Centre, etc.	List Service Providers and their service codes	Chalkboard Charts
WEEK	General Objective: 3.0: Understand the essential components of GSM Systems and their functions		
	3.1 Describe the components of GSM System Mobile Station (MS), Base Station, Mobile Switch Centre	Field trip to Service Provider	
	3.2 Describe software and hardware components of GSM phones	Explain and highlight differences between soft and hardware components of GSM	Handsets Charts
	3.3 Explain the functions of the essential parts of mobile phones <ul style="list-style-type: none"> ● CPU ● SIM Card ● SIM Card Connector ● Keyboard ● Battery ● Power supply Unit ● Earpiece ● Memory, etc. 	Show the essential parts and explain the functions of each	Mobile Phones
	3.4 List and explain some essential websites for	Carry students to Internet café and	Internet café

	Service Providers and mobile phones manufacturers	browse their websites	Manuals
WEEK	General Objective: 4.0: Understand the fault finding and repairs of mobile phones		
	4.1 Identify health and safety measures to be observed when using mobile phones		
	4.2 List and describe the tools required in the repairs and maintenance of mobile phones	Observe the safety rules as described in the manufacturers manuals	Manuals
	4.3 Describe the care and maintenance procedures of various mobile phones	Show each tool and use it to carry out repair work	Various tools
	4.4 Explain the precautions to be observed during fault finding and repairs	Demonstrate how to turn-off handset when trouble-shooting, charging battery or removing Sim Card and other precautions.	GSM Handset
	4.5 Describe the step-by-step procedure of fault-finding and repair of phones		
	4.6 Identify common software and hardware problems in a mobile phone	Describe component problems in software and hardware mobile phones	GSM Handsets

GSM PRACTICAL

General Objective: 1.0: Know how to identify various section of the mobile phone		
Specific Learning Objectives	Teachers' Activities	Resources
<ul style="list-style-type: none"> - Identify the sections of mobile phone - 	Show and guide students to identify sections of mobile phone	Mobile phone
General Objective: 2.0: Know how to carry out preventive maintenance on the Mobile Phones		
<ul style="list-style-type: none"> - Demonstrate the use of cleaning aids - Demonstrate the use of software codes for fault-finding and repairs of a mobile phone 	<p>Demonstrate and guide students to use cleaning aids on mobile phone</p> <p>Demonstrate and guide students to use software codes for fault-finding and repairs</p>	Cleaning aids: <ul style="list-style-type: none"> - brush - Mentholated spirit - Drier, etc.
General Objective: 3.0: Know how to carry out fault-finding and repairs of mobile phones		
<ul style="list-style-type: none"> - Demonstrate fault-finding and repairs of CPU, ROM and RAM of mobile phones - Demonstrate fault-finding and repairs of power supply and charging system of a mobile phone - Demonstrate fault-finding and repairs of RF sections of mobile phones - Demonstrate the use of software devices in fault-finding and repairs of mobile phones - Demonstrate the fault-finding and repairs of multimedia interfaces, e.g. camera, Bluetooth, infra-red, radio, etc. 	<p>Demonstrate and guide students in fault-finding and repairs procedures</p> <p>Demonstrate and guide</p> <p>Demonstrate and guide</p>	<ul style="list-style-type: none"> - Mobile phone - Oscilloscope - Non Contact Soldering Iron - Logic pulsar - Lead - Lead Sucker - Soldering paste <p>- Unlocking box</p>

PRACTICAL CONTENT

COURSE TITLE: Computer System Maintenance I

General Objective: 1.0: To introduce students to computer system maintenance workshop			
	Specific Learning Objectives	Teachers' Activities	Resources
	1.1 Demonstrate safety practices in the computer maintenance workshop	Guide students to exhibit safety precautions in the workshop.	Standard computer maintenance workshop with all facilities
General Objective: 2.0: Know how to use tools, and test equipment and cleaning aids			
	2.1 Demonstrate how to use basic tools 2.2 Demonstrate how to use test equipment 2.3 Demonstrate how to use cleaning aids	Guide students to use tools - test equipment, and - cleaning aids	Nut drivers, chip extractor/inserter tweezers, torx drivers, Screw drivers, part grabber/thermostats. Multimeter logic probe/pulser outlet tester ICs chip tester Cleaning solution, CD ROM cleaner, Floppy disk cleaner, dusters, Vacuum cleaner brushes and swabs
General Objective: 3.0: Know various components of the computer system			
	3.1 Identify the various components of computer system	Guide students to identify various components of the computer system	Computers
General Objective: 4.0: Know how to service computer Power supply			
	4.1 Identify various section of computer Ps	Guide students to identify various	Power supply

	4.2 Demonstrate fault-finding and repairs in computer Ps	sections of computer Ps Demonstrate and guide students to find faults and carry out repairs in computer Ps	Oscilloscope Voltmeter Variable AC Transformer Multimeter Soldering Iron Lead sucker
General Objective: 5.0: Know how to carry out maintenance of computer system			
	<p>5.1 Perform cleaning of:</p> <ul style="list-style-type: none"> i) motherboard ii) connectors and contacts iii) keyboard and mouse <p>5.2 Perform fault-finding and repairs in:</p> <ul style="list-style-type: none"> ● motherboard ● RAM ● ROM ● Hard disk <p>5.3 Perform fault-finding and repairs in Computer monitor</p> <p>5.4 Perform fault-finding and repairs in printers</p> <p>5.5 Perform fault-finding and repairs in peripherals:</p>	<p>Demonstrate the use of flow chart in fault-finding and repairs:</p> <ul style="list-style-type: none"> ● Functional test e.g. visual test, etc. ● Eliminate functional parts of computer ● Isolate the fault to a particular part ● Investigate individual components ● Replace faulty components ● Perform appropriate functional test <p>Demonstrate the use of alignment software for CRT.</p> <p>Demonstrate dismantling and</p>	<ul style="list-style-type: none"> ● Computer system ● Test Equipment ● Printer ● Monitor ● Diagnostic software

	<ul style="list-style-type: none"> • Keyboard • Mouse • Speaker, etc. <p>5.6 Perform formatting of a disk using:</p> <ul style="list-style-type: none"> • DOS format command • WINDOWS format command <p>5.7 Perform maintenance of floppy disks and drives</p> <p>5.8 Carry out system configuration of floppy disk drive for installation</p> <p>5.9 Perform the physical installation by connecting with cables</p> <p>5.10 Carry out hard disk installation based on the following steps:</p> <ul style="list-style-type: none"> • Configure the drive • Configure the controller • Physically install the drive • Configure the system <p>5.11 Use general purpose diagnostic available to test:</p> <p>i) memory module</p>	<p>assembling of CRT and colour adjustment of CRT</p>	
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	<ul style="list-style-type: none"> ii) floppy drive iii) Hard disk drive iv) Video board, etc <p>5.12 Apply the operating system diagnostic software to carry out preventive maintenance</p> <p>5.13 Use the following diagnostic software:</p> <ul style="list-style-type: none"> i) Norton utilities ii) Antivirus software iii) Microscope, etc. 		
General Objective: 6.0: Know how to upgrade computer system			
	6.1 Demonstrate how to upgrade computer system	Demonstrate and guide on how to upgrade computer system	Upgradeable computer system Upgrades

DIGITAL COMPUTER PRACTICAL

	Specific Learning Objectives	Teachers' Activities	Resources
1.	Demonstrate binary arithmetic using digital kits	Guide students to carry out basic arithmetic operations	Digital kit
2.	Demonstrate AND, OR and NOT gates operation	Guide students to demonstrate gates operations	Bulbs Digital kits
3.	Demonstrate NAND, NOR, XNOR gates operation	Guide students to demonstrate a ... gates operation, RS latch	Digital kits
4.	Demonstrate D, T and JK* flip-flops	Guide students to demonstrate ...	Digital kits

References:

1. C. S. French, “Computer Science”, ELBS,
2. S. M. Asser, V J Stiglianv, R F Bahrenburg, “Micro Computer Servicing – Practical systems and Troubleshooting, Macmillan Publishing Company, 2nd Edition, 1990
3. K. MacRae, “The Do-it-Yourself PC Book”, Osborne/McGraw-Hill, 2001
4. M. Lotia, P. Nair, “Modern All about Motherboard”, BPB Publications, 1990

References:

1. Repairing Typical Selection for Nokia series by Sky Magazine Office
2. Mobile Phone Repairing Techniques by NET (Volumes 1 – 6).
3. Basic Information for Mobile Phone users by Best Konsults Limited.
4. GSM engineering and Maintenance Manual by Best Konsults Limited
5. Mobile Phone Maintenance Techniques by Jide Owatunmise (in-print).

TOOLS/EQUIPMENT

Tools

S/NO	TOOLS	Quantity	S/NO	TOOLS	Quantity
1.	Electronic precision set (screwdrivers)		9.	Booster/ac adaptor	
2.	Soldering Iron		10.	Top Bond or Evostic	
3.	Soldering Lead		11.	Aluminium Foil	
4.	Soldering paste		12.	Magnifier	
5.	Drier		13.	Lamp	
6.	Mentholated Spirit		14.	White Paper Tape	
7.	Brush		15	Eraser	
8.	Cutting Plyer				

Measuring Instruments

S/NO	TOOLS	Quantity
1.	Multimeter (Analog and Digital)	
2.	Voltage Regulator	
3.	Oscilloscope	
4.	Board Reader	

Equipment

S/NO	TOOLS	Quantity
1.	Computer System	1 Unit
2.	Unlocking Box with Cables	1 Unit
3.	Rework Stasis	

Other Materials

Colour manuals of various handsets showing the flowchart/schematic diagrams –

1 Unit of each.

PARTICIPANTS

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