NATIONAL BOARD FOR TECHNICAL EDUCATION

Innovation Development and Effectiveness in the Acquisition of Skills (IDEAS) Project

THE WORLD BANK

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

JANUARY, 2023

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.

Behavoural 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 behavoural 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 week 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 or

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 NTC and ANTC 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 Technical Certificate
2.	Advanced Craft Level	Advanced National Technical 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 device 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 DURATION
-	-	-	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 Language	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	216
7	CEI 11 (COPY FROM ELECTRICAL INSTTALLATION)	Basic Electricity	2	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72
8	CRT 12 (COPY FROM RADIO AND TV)	Electronics Devices & Circuits	-	-	-	-	-	-	-	2	2	1	2	1	3	2	3	1	3	1	3	288
9	CCS 10	Introduction to Computers	1	2	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	108
10	CCS 11	Mobile Communication	1	3	1	3	1	3	1	3		1	3	-	-	-	-	-	-	-	-	240
11	CCS 12	Computer System Maintenance I	2	4	2	4	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	216
12	CCS 13	Digital Computer Electronics	-	-	-	-	2	4	2	4		2	4	2	4	-	-	-	-	-	-	288
		Total																				**3,264**

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	108
6	CCS 20	Intro to Computer Networks	1	3	1	3	1	3	144
7	CCS 21	Computer Application Package	1	3	1	3	1	3	144
8	CCS 22	Global System of mobile Communication	2	4	2	4	2	4	216
9	CCS 23	Computer System Maintenance II	2	4	2	4	2	4	216
		Total							**1,116**

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

MODULE: CEI – BASIC ELECTRITY

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 State Ohm's Law and applies it to calculate resistance, voltage and current.
3.0 Understand the chemical sources of Electro Motive Force (EMF).
4.0 Understand Resistor and Capacitor colour coding.
5.0 Understand the construction of resistors, inductors and capacitors and explain their functions in a simple circuit
6.0 Understand the difference between AC and DC currents and voltages.
7.0 Understand the principles of transformer, its construction and operations.
8.0 Understand 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: Basic Electricity	**Course Code: CEI II**	**Duration: 72 Hours**
Course Specification:	**At the conclusion of this module, the student should be able to understand and demonstrate the basic electrical theory**	

Week	**General Objective: 1.0 Understand the Structure of matter and its relevance to electricity/electronics.**					
	Theoretical Content			**Practical Content**		
	Specific Learning Outcome	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
1	**Structure of Matter** 1.1 Define the following: (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.	White board Textbooks Models Projector Public address system			

1	1.2 Explain the difference between positive and negative charges.	Give full explanation on the difference between positive and negative charges.	White board Projector Public address system			
2	1.3 Explain the flow of electricity	Use circuit construction kit or any other circuit simulation software to describe how electricity flows. Use a bulb, switch and power battery	White Board Projector Public address system Bulb, switch, wire, battery Computer system Circuit construction kit (software)	Investigate the flow of electricity	Connect a simple circuit to guide students understand the flow of electricity through a bulb	
3	1.4 Distinguish between insulators and conductors	Explain insulator and conductors with sample	Conductors Insulators	Identify conductor and insulators used in electrical installation.	Guide students on how to identify different types of cables and insulators	

WEEK	General Objective: 2.0 State Ohm's law and apply it to calculate resistance, voltage and current. Year 1 Term 2					
3	**Specific Learning Objectives**	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
	Ohm's Law and its Application: 2.1 Define the following terms: • Voltage • Current • Resistance 2.2 State Ohm's law	Explain Voltage, Current and Resistance State Ohm's Law and drive the mathematical expression for	White board Textbook Projector Variable DC Power supply unit Multi-meter	Verify the relationship between Current, Voltage and Resistance	Guide students to use multimeter. By experiment, guide students to Verify Ohm's law.	
4	2.2 Calculate Resistance, Voltage and Current using Ohm's law e.g. - R = V/I	Solve some problems using Ohm's law	White Board Textbook			

4-5	2.4 Determine the equivalent value of: a. resistors in series b. resistors in parallel c. series and parallel	Explain how resistor can be connected in series, parallel and series-parallel	White Board Resistor Bread board	Construct resistors using Series, parallel and series/parallel connection	Guide student to connect resistors in series, parallel and series/parallel and measure the equivalent	
6	2.5 Determine the equivalent voltage of: a. batteries in series b. batteries in parallel c. batteries in series parallel connection	Explain how batteries can be connected in the three modes by asking	White Board DC batteries Connectors Voltmeter	Construct series /parallel connection of batteries	Carryout series/parallel connections of batteries.	
7	2.6 Determine the equivalent value of capacitors connected in series, parallel and series parallel	Explain how capacitors can be connected in series,	White Board Capacitors Bread board Connectors Power supply	Construct series /parallel connection of capacitor	Carryout series/parallel connection of capacitor in a circuit.	
8	2.7 Determine the equivalent value of inductors, connected in series and parallel	Explain how inductors are connected in series and parallel by asking questions	Textbooks Whiteboard Inductors Bread board Connectors Power supply	Construct series /parallel connection of inductor in circuit	Carryout series/parallel connection of inductor in a circuit.	

9-10	2.8 State Kirchoff's laws: - Current law - Voltage law	State KVL & KCL. Use vector diagrams to explain the current and voltage law. E.g. $I_1 + I_2 + I_5 = I_3 + I_4$	White board Resistors Variable DC power Multimeter Connectors Breadboard Animation videos	Verify Kirchhoff's current and voltage laws	Carryout experiments to verify kirchoffs laws	
9-10	2.9 Solve simple numerical problems involving 2.8 above.	Draw simple circuits to illustrate the laws and solve some problems.	White board projector			
11	2.10 State Superposition theorem	Discuss with the aid of diagrams, the Superposition theorem.	White board Textbook projector			
11-12	2.11 Solve simple numerical problems to illustrate Superposition theorem	Use simple circuits to illustrate the theorem.	White board Textbook projector	Carryout calculations on Superpositio n Theorem	Demonstrate by experiment the Superposition theorem	

Wee k	**General Objective: 3.0 Understand the chemical source of electromotive force.**					
	Specific Learning Objectives	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluatio n**
4						

	Electro Motive Force [emf] 3.1 Explain: (i) current (ii) voltage (iii) E.M.F (iv) electric power (v) energy (VI) Resistance	Discuss EMF, electric power and energy stating their unit, symbol and formula. Work problems based on Power and Energy	Whiteboard Textbook Projector Smartboard Batteries Animation videos from YouTube	Illustrate how to measure the EMF of a battery	Guide students to understand Electromotive Force	
5	3.2 Distinguish between E.M.F. and potential difference (P.D)	Differentiate between EMF and P.D.	Whiteboard Textbook			
6	3.3 Explain Primary and Secondary Cells	Describe Primary and Secondary Cells and their constructions	Cells	Illustrated the differences between Primary and	Guide students to understand cell and Battery.	
8	3.4 Explain cells in: i. Series ii. Parallel iii. Series – Parallel	Explain how to connect cells in series, parallel and series -parallel Explain the advantages of cells in series	Battery connectors Bulbs Voltmeter Ohm meter Ammeter Animation videos from YouTube	Connect series and parallel connection.	Guide students on how to carryout series and parallel connection.	

9	3.5 Explain the effects of internal resistance on battery voltage output.		Describe with calculations how internal resistance affects battery voltage.	Whiteboard Textbooks Battery Multimeter	Illustrate internal resistance of a battery	Guide student to carry out experiment on internal resistance of battery	
Week	**General Objective: 4.0 Understand resistor and capacitor colour coding**						
	Specific Learning Objectives	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**		**Evaluation**
12	**Values of Resistors and Capacitors** 4.1 Explain the Colour coding system of i. resistors ii. capacitors	Discuss colour coding of resistors and capacitors.	Whiteboard Textbooks				
13	4.2 Determine the following: i. Resistance of a resistor using colour codes ii. Capacitance of a capacitor using colour codes	Explain using colour code, show how to calculate the values of resistor and capacitor	Whiteboard Textbooks Resistors and Capacitors colour code charts multimeter	Identify Resistance/Capacitance of Resistor/Capacitor using color code	Demonstrate with example how to identify Resistance /Capacitance of Resistors and Capacitors using color code		

13	4.3 Explain the tolerance of resistors and capacitors.	Discuss how to calculate the tolerance of resistors and				

Week	General Objective: 5.0 Understand the construction of resistors, inductors and capacitors and explain their functions.					
	Specific Learning Objectives	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
10	**Resistors, Inductors and Capacitors** 5.1 Explain how to Identify types and sizes of the following: i. Resistors ii. Capacitors iii. Inductors.	Discuss resistors, capacitors and inductors. State the units and symbols of resistance,	Capacitors Inductors Resistors Textbooks projector	Identify resistors, capacitors and inductors.	Guide students on how to identify resistors, capacitors and inductors.	
11			Resistors (carbon, wire wound, variable, choke, etc) Textbook projector	5.2 Identify the following resistors: i. Carbon type resistor ii. Wire wound type resistor iii. Variable resistors iv. Fixed resistors	Guide students on how to identify different type of resistors	

10	5.3 State the function(s) of the following in a Circuit and identify their symbols: i. Resistors ii. Capacitors iii. Inductors	Explain the functions of resistors, capacitors and inductors in circuits	Model circuits Textbook projector	Illustrate how to identify the components in 5.3 and know their functions.	Using a model circuit, guide students to identify and know the functions of the components in 5.3 in a circuit	
10	5.4 Explain the constructional detail of the following: i. Resistors ii. Capacitors iii. Inductors	Describe the constructional detail of the three components.	White Board Resistors Capacitors Inductors projector	Illustrate the constructional details of resistor, capacitor and inductors	Illustrate with the aid of diagram constructional detail of the following: i.Resistors ii. Capacitors iii. Inductors	
11	5.5 Explain the meaning of power rating of a resistor	Explain power rating of resistors.	Textbook White Board Resistors of different	Identify the power rating of different resistors.	Guide students to read the power rating of various resistors.	

11	5.8 Explain the working voltage of a capacitor	Describe the maximum working voltage of a capacitor.	White Board Capacitor	Illustrate the working Voltage of a capacitor	Guide students to physically identify the working voltage of various capacitors.	
	5.9 Explain the applications of types of inductors	Discuss the applications of types of inductors in circuits	Different types of Inductors Text book White Board	Identify the applications of Inductors	Show the students some practical applications of inductors	

WEEK	**General Objective: 6.0 Distinguish between AC and DC Current and Voltages: Year 2, Term 1 Contact Hour:**					
	Specific Learning Objectives	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
1	**AC and DC Quantities** 6.1 Explain the characteristics of AC and DC and their differences.	With the aid of diagrams, explain the differences between AC and DC.	Whiteboard AC/DC appliances	Identify AC/DC appliances	Guide students to identify AC and DC appliances	

3	6.2 Define peak value, mean value, rms value, and frequency of a sine wave.	Explain with the aid of diagrams, AC variables like rms mean value, etc.	White Board Oscilloscope Signal Generator	Illustrate sign wave of AC quantities	Show by experiment the features of AC signals	

4	6.3 Calculate peak value from rms values of current, and voltage, and vice- versa	Work some examples on how to calculate the variables above	White Board Textbook Projector			
5	6.4 Explain the effect of the following in AC circuit: i. Resistance I ii. Capacitance I iii. Inductance (L)	Describe the effects of Resistance, capacitance and inductance on AC current and voltage. -	White Board Textbook Projector Inductors Capacitors Resistors Breadboard Jumpers Power supply Multimeter	Illustrate the effect of R, L and C on AC voltage and current.	Guide students to observe by experiment, the effect of R, L and C on AC voltage and current. Construct and observe the behavior of: 8. series R-L circuit ii. Parallel R-L circuits iii. series R-C circuit iv. parallel R-C circuit.	

6	6.5 Calculate inductive and capacitive reactance. $X_L = 2\pi fL$ $X_c = \frac{1}{2\pi fC}$	Explain inductive and capacitive reactance and work some calculation on X_L, and X_C,	White Board Textbook			
	6.6 Explain the combined effect of R, L and C in AC circuit	Describe the voltage and current relationship in R – L– C in series and parallel	White Board Projector Resistors Capacitors Inductors Jumpers Power supply	Investigate the effects of R, L & C in series and parallel	Guide students to build and analyze series and parallel R-L-C circuit	
Week	**General Objective: 7.0 Understand the principles of transformer, its construction and operations.**					
	Specific Learning Objective	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
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 f. magnetic flux	Describe magnetism and explain temporary and permanent magnet. Define laws of magnetism, show diagrams where	Whiteboard Textbook Magnetic bar Power source Connectors Copper wire Power source Magnetic	Illustrate how to generate magnetism	Demonstrate how to generate magnetism	

9	7.2 Explain the effect of fields as applied to electro- magnetism	Describe magnetic fields.	Whiteboard Permanent Magnet Iron filing Copper conductor Plane paper	Illustrate electromagnetic field	Demonstrate how to visualize magnetic flux (lines of force) Demonstrate the effect of magnetic fields	
10	7.3 Define a transformer 7.4 State the colour code used for the winding of transformer.	Explain a transformer and its construction. Explain types of transformers Show the colour codes	Colour coded transformers Chart Different types of transformers	Identify transformer winding and its colour codes	Guide students to identify types of transformers. Differentiate transformer winding using color codes	
10	7.5 Describe with the aid of sketches the principles of operation of a single phase, double wound transformer. .	Explain the principles of operation of a 22gni phase, double wound transformer.	Transformer Chart White Board Copper wire Laminated core Winding	Illustrate the construction of transformer	Guide students to construct a single phase double wound transformer	

12	7.6 Explain the types of losses in transformers and ways to reduce them in transformers.	Explain iron and copper loss and how to reduce them	Whiteboard Projector			
	7.7 Calculate transformer efficiency	Explain efficiency and work some examples on efficiency	Whiteboard Textbook Projector			
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**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
	Electrical Circuit 8.1 Define the term electric circuit. 8.2 Differentiate between series and parallel circuits	Explain an electric circuit and state the difference between series and parallel circuits	Whiteboard Textbooks/Notes Projector Bulbs Switches Power supply	Illustrate Electrical circuit	Construct simple electric circuits to illustrate series and parallel circuits and open and closed circuit.	

1	8.3 Calculate the total resistance in a series D.C. circuit	Give students some exercises to solve	Whiteboard Textbook Calculator			
2	8.4 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.	Calculator Chalkboard Projector			
5	8.5 Calculate the current in each arm of a parallel circuit.	Guide students to calculate the current in each arm.	White Board Projector			

8	8.7 Calculate the voltage and current in a series and parallel circuit.	With aid of circuit diagram, explain how to calculate voltage & current in series-parallel circuit	White Board Projector	Illustrate how to calculate voltage/current in series-parallel circuit	Guide students to calculate voltage & current in series and parallel circuit.	
9	8.7 Explain the effect of power factor in AC circuits	Explain the effect of power factor and how to Improve it.	White Board Projector			
10	8.8 Calculate impedance in an AC Circuits	Explain impedance, give the symbol, unit and formula for calculating impedance	Textbooks Calculator White Board Projector			
11	8.9 Explain the meaning of resonance in AC circuit: a. series circuit b. parallel circuit	Describe with the aid of diagram, resonance in series and parallel circuit and carry out simple	White Board Projector	Demonstrate resonance circuit	Demonstrate by experiment series and parallel resonance in AC and DC circuits	

12	8.10 Explain the following: a. Q factor b. Bandwidth c. Resonance frequency	Describe Q factor, B.W. and Fr. State the relationship among the three. Do some calculations on the three.	White Board projector			
12-13	8.11 Calculate resonant frequency.	Do some calculations on the three.	White Board projecter			
Week	**General Objective: 9.0 Understand the operation, uses and limitations of indicating and measuring instruments and how to operate them.**					
3-5	**Special Learning Objective**	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
	Indicating Instruments 9.1 Explain the functions of a Voltmeter, Ammeter, Ohmmeter and Multimeter	Describe the parts, operation and uses of multimeter.	Multimeter (digital and Analogue) White board projector	Operate measuring instruments	Demonstrate how to use indicating instrument	
10-12	9.2 Describe the functional parts of an Oscilloscope.	Explain the functional parts of an Oscilloscope	Oscilloscope ad its documentation Whiteboard projector Notes.	Operate oscilloscope	Demonstrate how to operate an oscilloscope	

	9.3 State the limitations of analogue and digital measuring instrument	Explain the limitations of analogue and digital measuring instrument.	White Board	Identify digital and analogue measuring instrument	Identify digital and analogue measuring instrument	

Evaluation Guide:
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 and Global System Mobile (GSM) Handsets Maintenance Craft Practice**

MODULE: CRT 12 – Electronic Devices and Circuits

DURATION: **288**

PRE-REQUISITE: CEI - I 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:

8.5 Understand the basic principles, characteristics of common electronic devices, such as diodes, transistors, etc.

2.0 Know the applications of common Electronic Devices.

3.0 Know how to identify semi-conductor IC's

4.0 Understand the principles of construction and operation of power supply.

5.0 Know the operation of Oscillator Circuits.

6.0 Know the use of Logic Elements

7.0 Understand the principles of modulation and demodulation.

8.0 Know the various Acoustics devices/equipment.

9.0 Understand the techniques of PCB production.

PROGRAMME: **NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS MAINTENANCE CRAFT PRACTICE**

Course: Electronic Devices and Circuits	**Course Code: CRT 12**	**Contact Hours: 3-2** **Year 2, Term 1**

Course Specification	**Theoretical Content**	**Practical Content**

WEEK	**General Objective: 1.0 Understand the basic principles, characteristics of common electronic devices, such as diodes, transistors, etc.**					
	Specific Learning	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers'**	**Evaluation**
1-4	1.1 Explain the basic concept of (a) Electronic Emission (b) Conductor, insulators and semiconductors 1.2 Explain the construction, operation and characteristics of semi-conductor diode. 1.3 Explain the effect of load on the characteristics 1.5 Define rectification and describe rectification in a diode circuit. 1.6 Set up rectifying circuits.	Describe the types of electronic emission and semi-conductor materials (silicon, germanium) * Make a graphical representation of typical familiar V/I curve for a diode. Use chart to explain the effect of load on the characteristics. Explain the concept of rectification.	White Board and Pictorial aids, Semiconductor diode, pictorial chart Breadboard experiment kit and power- supply Use pictorial diagram to show different types of Rectification Practical Rectifier circuits and oscilloscope, step down transformer.	Demonstrate the operation and applications of a semi-conductor diode	Set up some circuits to demonstrate the operation and applications (switch, rectifier, etc) of semiconductor diode.	

Week	**General Objective: 2.0 Know the application of the characteristics of common Electronic Devices**					
5-7	Specific Learning Objectives:	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**

	2.1 Explain the construction, operation, characteristics and applications of bipolar transistor. 2.2 Explain the types of bipolar transistor 2.3 Explain transistor configuration. 2.4 Explain uses of bipolar transistors and heat sink 2.5 Show graphically the effect of load on gain of a transistor. 2.6 Determine transistor parameters 2.7 Describe the operation of photoelectric devices like solar battery, light dependent resistor and diodes. 2.8 Describe the structure and design of Cathode Ray Tube	Describe the construction of a bipolar transistor and explain its operation. Explain the characteristics of bipolar transistors Discuss the applications of bipolar transistors Explain the transistor configurations: (8) Common Emitter (ii) Common Base (iii) Common collector Determine transistor parameters. Ie = Ic + Ib Calculations on $V_{cc,}$ V_{ce} V_{be} etc. Describe how to select equivalent replacement using transistor manual.	Transistor (NPN & P.N.P.) Power transistor on Heat sink. Pictorial charts. Transistor data sheet Multimeter Breadboard Connectors Power supply unit Resistors Capacitors Indicators (LED) Resistors, capacitors, power supply unit	Illustrate how to identify the terminals of transistor and its applications.	Guide students to identify the 3 terminals of a transistor and know their types. Guide student to set up laboratory experiment to plot characteristics of transistor. Guide students to perform Soldering/de soldering exercises on electronic circuit boards. Build simple circuits to illustrate the applications of transistor as a switch and as an amplifier.	

8-10	2.10 Describe the working principles and application of photo-electric devices 2.11 Describe Cathode Ray Oscilloscope (CRO)	Explain the working principles and application of photoelectric devices such as solar cells, light dependent resistor and photodiodes. Explain the construction and working principles of a Cathode Ray Oscilloscope (CRO).	Resources Variable power supply, Ammeter, voltmeter graph Sheets. Solar cell. Light dependent resistor and photodiode. Vectoral diagrams of the devices. Well sketched diagram of a cathode ray tube on Poster.			

WEEK	General Objective: 3.0 know how to identify semiconductor IC's.					
	Specific	**Teachers**	**Resources**	**Specific Learning**	**Teachers'**	**Evaluation**
11	3.1 Explain how to identify IC symbol in circuit diagram 3.2 Explain how to identify IC pins	Discuss how to identify IC symbol in circuit diagram Explain how to identify IC pins	IC Manual chart Projector Whiteboard IC packages	Identify IC symbol in circuit diagram Identify IC pins	Present different type of IC (s) physically and demonstrate their application. Demonstrate how to identify IC symbol in circuit diagram Identify IC pins	

	General Objective: 4.0 Understand the Principles of Construction and Operation of Power Supply					
Week	**Specific Learning Objective.**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
1-6	Power Supply 4.1 Describe the principle of Operation of Linear power supply. 4.2 Explain power supply in a schematic diagram. 4.3 Explain half wave and full wave rectification. 4.4 Explain a stabilized low-voltage D.C. power supply unit. 4.5 Differentiate between half and full wave rectifiers and state their advantages and disadvantages. 4.6 Explain the effect of capacitors and inductor in a power supply. 4.7 Explain the waveform at various points of power supply.	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. Explain the concept of half-wave and full-wave rectification. Discuss the 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	Schematic diagrams of: (I) half-wave rectifier (ii) full- wave rectifier. Graph sheets, oscilloscopes, 34rgan diode, power capacitors and transistors, various transformers: (I) step up and (ii) step down. Rectifier diodes Whiteboard Projector Breadboard	Illustrate the principle of Operation of Linear power supply. Illustrate how to construct a stabilized low-voltage D.C. power supply unit	Guide students to understand the principle of Operation of Linear power supply. With the aid of a schematic diagram construct a stabilized low-voltage D.C. Power supply unit	

7-9	4.8 Explain the difference between regulator and stabilizer. 4.9 Explain Switched Mode Power supply; Theory of operation, and evaluate performance using a circuit diagram. 4.10 Distinguish between linear power supply and switched mode power supply	Explain the function of a regulator and a stabilizer in a power supply unit. Discuss Linear power supply switched mode power supply (SMPS) Illustrate the concept of design of simple power supply unit,		Illustrate the function of a regulator and a stabilizer in a power supply unit.	Illustrate the function of a regulator and a stabilizer in a power supply unit.	

Week	**General Objective: 5.0 Know the Operation of Common Oscillator Circuits**					
	Specific Learning Objective	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
	5.1 Explain concept of Oscillation 5.2 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 5.3 Explain 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 the following: Astable Multi vibrator Bistable Multivibrator Monostable Multivibrator.	Explain with the aid of diagrams the concept of Oscillation Discuss the circuit diagram of various multivibrators and explain why they are so- Called. Provide examples of radio and TV tuners. Explain the applications of multivibrators	Stone and water bowl, Turning fork, guitar, etc. circuit diagrams of oscillator, Hartley, Colpitt, Crystal controlled, tuned and tuned grid, signal generator. Switches, bulb & oscilloscope. Circuit diagrams. Power supply, transistors, resistors, capacitors, Vero boards, connecting leads, soldering station lead sucker	Demonstrate the concept of Oscillation using Stone in water medium, using fork, string and wind instruments. Supervise the construction of a multivibrator Circuit (flip-flop).	Guide students to understand the concept of Oscillation Demonstrate using switches and electric bulbs the operation of a bistable multivibrator and observe the output from the scope.	

Week	**General Objective: 6.0 Know the use of Binary numbers and Logic Elements**					
	Specific Learning Objective	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
5-6	6.1 Explain the use of binary numbers in electronic circuits. 6.2 Explain logic circuit of AND OR NOT 6.3 Explain the operation of gates mentioned 6.2 above 6.4 Explain logic gate IC's	Discuss binary and logic concepts and their application to electronics circuits. Discuss the truth tables for AND, OR and NOT gates Explain some logic gate IC's	Whiteboard Projector Symbols and diagrams of logic circuits Logic gate symbols truth table for the logic gates mentioned. Logic gates modules	`Illustrate the operation of AND, OR and NOT gates	Guide students to connect up logic gates to illustrate the following functions: (I) AND, (II) OR and (III) NOT gates	

Week	**General Objective: 7.0 Understand the Principles of Modulation and Demodulation**					
	Specific Learning Objective	**Teacher's Activities**	**Resources**	**Specific Learning**	**Teachers' Activities**	**Evaluation**
7-9	7.1 Explain the principles of modulation and demodulation. 7.2 Explain the purposes of modulation and demodulation. 7.3 Draw the modulation envelop. 7.4 Explain demodulation circuits in AM radio sets. 7.5 Explaindemodulation and Modulation circuits, in F.M. radio sets. 7.6 Explain how signals are detected.	Discuss modulation and Demodulation and explain their principles Discuss the need for and the effects of amplitudes and frequency modulation for long distance broadcasting. Discuss diagrams of modulation concept of modulation and demodulation as applied F.M. and AM systems Discuss how signals are detected in (8) AM receiver, and (II) FM receiver	Charts showing modulation and demodulated envelopes. FM & AM R.F. signal generator Dual channel Oscilloscope signal tracer AM Radio receiver FM Radio receiver set of screw drivers AM and FM trainers	Illustrate modulation and Demodulation Illustrate the concept of modulation and demodulation as applied F.M.	Guide students to understand and explain the principles of modulation. Using oscilloscope and signal generator, carryout experiment to show modulated and demodulated signals. Dismantle an AM radio set and identify. (8) Demodulation circuit (ii) Mixer circuit Dismantle an FM radio set and identify (8) Demodulation circuit (ii) Modulation circuit (mixer)	

WEEK	**General Objective:8.0 Know the various Acoustics Devices/Equipment**					
	Specific Learning Objectives:	**Teacher's Activities**	**Resources**	**Specific Learning**	**Teachers' Activities**	**Evaluation**
10-13	Acoustics 8.1 Explain basic working principles of: (i) Loud speaker (ii) Microphone (iii) Public address System (iv) Compact Disc 8.2 Explain how to set up and operate a public address system. 8.3 Explain the troubleshoot and repair procedure of faulty P.A.S.	Discuss the circuit symbols for the acoustic devices mentioned and state the function performed by each. Discuss the working principles of these devices. Teachers are to alert students about risk of laser rays on functional compact disc players.	Loudspeaker microphone PAS Compact disc charts. Faulty PAS Equipment Toolkit	Illustrate the basic working principles and operation of a public address system.	Guide students to understand the basic working principles and operation of a public address system. Set up a public address system incorporating microphones, amplifiers turntable and loudspeaker, with stabilized power supply source.	

WEEK	**General Objective: 9.0 Understand the techniques of PCB production.**					
	Specific Learning Objectives:	**Teacher's Activities**	**Resources**	**Specific Learning**	**Teachers' Activities**	**Evaluation**
10-13	Printed Circuit Board (PCB) 9.1 Explain printed circuit board (PCB) 9.2 List some of the layers of a PCB 9.4 Explain the characteristics of PCB electronics 9.3 Explain the procedures for PCB production	Explain PCB List some of the layers available in PCB Discuss the characteristics of a PCB electronics: through hole and surface mount. Explain the procedure for PCB manufacturing.	White board Projector Plain PCB boards PCB etching machine Ferric chloride Etch resistant pen Cleaning solution Mini drilling machine Mini vise with clamp Soldering station Lead Plotted Printer Magnifying lens Transparent paper Design software (e.g. multisim)	Illustrate how to manufacture PCB	Guide students to produce a simple PCB of a selected circuit. Drill, mount components, solder and test the PCB.	

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS MAINTENANCE CRAFT PRACTICE		
MODULE: INTRODUCTION TO COMPUTERS	**MODULE CODE: CCS 10**	**TOTAL CONTACT HOURS: 108Hrs**
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:** 8.5 **Know Computer and 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 AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS MAINTENANCE CRAFT PRACTICE						
Module: Introduction to Computers.		**Module Code: CCS 10**		**Contact Hour/Wk: 2 Hrs Theory/3 Hrs Practical/2 Terms**		
Module Specification: Theoretical Contents				**Practical Contents**		
WEEK	**General Objective: 1.0 Define computer and know its classifications. Year 1, Term 1**					
1-2	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
	Development of Computers. 1.1 Explain the history of computers and its progression. 1.2 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 among analog, digital and hybrid computers. 1.5 Explain the types of micro computers.	1.1 Discuss the history of computers and its progression. 1.2 Discuss the concept of computer in relation to data and information. 1.1 Discuss types of computer with practical example Discuss the classes of computers according to type, purpose and size. Differentiate between the types of computers listed in 1.4 Discuss the various of microcomputers.	Magic board Charts/Posters Computers(Game console, Desktops, Laptops, Smartphones, Tablets, etc)	Demonstrate the classification of computers.	Guide students to identify classes of computers according to usage, purpose and sizes	

3-4	**2.0 Understand the impact and role of computers in modern society. Year 1, Term 1**					
	Role of computer in modern society. 2.1 List the application areas of computers in our society. 2.2 Explain the social implications of computers on society.	Discuss the principal uses of computers. Discuss the social implications of computers on the society. Discuss the impact of social media to our society.	White board Projector Computer			

	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.	Discuss the advantages of computers to the society Discuss the various areas of applications.				

	3.0 Know computer hardware and software elements of a computer. Year 1, Term 1					
5-11	3.1 Explain the constituent parts of computer. 3.2 Explain computer hardware. 3.3 Explain the functions of computer hardware.	Discuss the parts of a computer. Discuss computer hardware	Pictures/Posters. Set of computer Projector Magic board. Motherboard Expansion card Lesson note, etc.	Illustrate the various hardware components of a computer and their functions.	Guide students to identify the parts of a computer, identify the .	

	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, memory and hard disk drive. 3.8 List some auxiliary units.	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.	White board Computer system Sample input devices Sample output devices	Identify input and output devices	Guide the students to identify the input and output devices	
	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.	Discuss the difference between system and application softwares Explain the difference between high and low level languages. Identify source and object codes Explain Translator and show examples. Identify different types oftranslators: assemblers, compilers and interpreters. Explain different type of operating system eg, windows OS, MAC OS, Android, Linux etc.	White board Computer system Different software packages	Illustrate the differences between application software and system software	Illustrate the differences between application software and system software	

	4.0 Understand the EDP (Electronic Data Processing) Environment. Year 1, Term 1					
	EDP Environment. 4.1 Describe organizational structure of an EDP Environment 4.2 Explain the concept of computer systems. 4.3 Define information and explain the concept of information technology.	Explain the organization 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	White board Chart CD's Flash drive Hard disc drive HDD Casing External CD Drive Computer System **- do -**	Use diagram to Illustrate the organogram of an EDP Use diagram to illustrate the concept of computer system	Use diagram to Illustrate the organogram of an EDP Use diagram to illustrate the concept of computer system	

	5.0 Know the importance of security within the computer environment. Year 1, Term 2					
12-24	5.1 Explain data control techniques. 5.2 Identify and explain standard operating procedures of a computer installation.	Describe data control technique. List and explain standard operating procedures of a computer installation**.**	Whiteboard Antivirus Software CDs Computer System Fire Extinguisher	Illustrate the operating procedures of computer installation	Illustrate the operating procedures of computer	

	5.3 Explain the need for computer room security. 5.4 Explain computer systems auditing. 5.5 Explain prevailing safety regulations in computer installation. 5.6 Explain methods of preventing hazards (fire, flooding, sabotage, etc).	State the need for computer security in the computer room. Discuss computer auditing. Describe the various safety regulations applicable to computer installation. Enumerate methods whereby hazards could be prevented in computer room.		Carryout Computer System auditing.	Guide Learners on how to carryout Computer System Auduting	
	6.0 Know Data/File Securities and Control. Year 1, Term 2					

	Data/File Security 6.1 Explain Data security and control (8) Manual Control (ii) Data preparation control (iii) Validation checks 6.2 Explain file security and control (8) Describe file security methods in computer installations. (ii) Explain the need for file security.	Use question and answer Discuss 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: (8) their possible sources. (ii) Ways of getting rid of them.	Whiteboard Computer System Antivirus	Illustrate stages to generate user password and username Illustrate virus prevention in computer	Guide students on how to generate user password and username Help students to install antivirus	

25-36	**7.0 Understand the basic principles of Data Transmission. Year 1, Term 3**					
	Principles of Data Transmission 7.1 Define data transmission. 7.2 Explain the term telecommunication. 7.3 State different methods of data transmission. 7.4 Define computer Network. 7.5 State types of	Explain data transmission. Explain the term 'telecommunication'. Define Network Explain the differences between LAN and WAN Discuss the advantages of Network.	Computer systems Ethernet switches Routers both wired and wireless Network Repeaters Networking toolbox Network Analyser			
	8.0 Know how to use Keyboard. Year 1, Term 3					
	8.1 Explain keyboard layout 8.2Explain the function keys 8.3 Explain the Alphanumeric Keys 8.4 Explain the Numeric Keys 8.5 Explain the Control Keys	Discuss the items in 8.1 – 8.5	Computer software Typing Tutor.	Identification of the following keys: Function Keys Alphanumeric Keys Control Keys	Guide the students on how to use the function keys	

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS MAINTENANCE CRAFT PRACTICE		
Module: Mobile Communication System	**Module Code: CCS 11**	**Total Contact Hours: 60 HRS**
Course Specification:	**Theoretical Content**	**Practical Content**

GOAL: This course is designed to enable the learner understand the Concept of cellular/mobile communications

GENERAL OBJECTIVES.

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

1.0 Know the component of GSM system and its operation.
2.0 Understand basic GSM network operation.
3.0 Understand GSM Switching system
4.0 Understand the base station system (BSS)
5.0 Understand operation and support services
6.0 Understand GSM Security features.

PROGRAMME: **NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS MAINTENANCE CRAFT PRACTICE**						
COURSE: Mobile Communication System			**Course Code: CCS 11**		**Contact Hour: 1-3**	
GOAL: Understanding the concept of cellular / Mobile communications						
COURSE SPECIFICATION: **Theoretical Content**				**Practical Content:**		
WEEK	**General Objective:1.0 Know the component of GSM system and its operation**. **Year 1, Term 1**					
	Specific Learning Objective	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Evaluation**
1-12	1.1 Define the concept of Cellular Communications 1.2 Explain the basic operations of radio base station (RBS) 1.3 Discuss the concept of frequency reuses. 1.4 Explain cell splitting	Explain concepts of of Cellular Communication in details.	-White Board • Network Software Simulators. Mobile Phones	• Identify the functional modules in the GSM network. • Perform basic network tasks and configurations.	• Organise visit and outline specific objectives. • Students are to ask questions on all aspect of general course contents. • Demonstrate specific tasks and commands and general working principles. • Frequent visit to RBS, MSC of a GSM Operator.	

	1.5 Explain system operation layout of mobile phone service providers 1.6 Explain the operations and dimensions of i. Mobile Switching Center (MSC) ii. Call sites iii. Mobile units 1.7 Explain the term Call Hand off 1.8 Distinguish the following types of analogue mobile phone services: i. Narrowband analog mobile phone services (NAMP) ii. Digital advanced mobile phone Service (DAMP) 1.9 Explain the properties of radio channel 1.10 Explain the parameters of TACS 1.11 Describe the mobile network controller of TAC. 1.12 Explain the term call management in TACs	Explain the organization and operation of the GSM system. Discuss 1.6 to 1.12				

	1.13 Explain the following categorization of mobile communication system: i. Advanced mobile phone service (AMPS)- First generation ii. Global system for Mobile Communication- Second Generation ii. Third generation (3G) iii. 4G, 5G. 1.14 Explain the concept and evolution of Global system for Mobile communication. 1.15 State the merits and demerits of GSM technology. 1.16 Explain the GSM specifications in term of: i. Frequency band ii. Duplex distance iii. channel separation iv. Modulation v. Transmission rate vi. Access Method vii. Speech coder 1.18 Explain the following basic subscriber' GSM services: i. Fax mail	Explain with drawing / pictures the major concepts of new generation networks.	- Pictures - Manuals - White Board			

	ii. Short message services iii. Cell broadcast iv. Voice mail v. Telephony vi. Call forwarding vii. Barring of calls viii. Call line identification/restriction ix. Multiparty service etc 1.19 Explain the concept of Subscriber Identity Module (SIM) 1.20 Explain the operational principle of the GSM subscriber unit or handset					

	General Objective 2.0 Understand Basic GSM Network Operation					
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Evaluation**
	2.1 State the features of GSM Network 2.2 Explain the three major systems in GSM network: i. the switching system ii. the base station iii. Operation and support system.	Discuss systems in GSM network	- WhiteBoard - Practical Manuals - Computer - Mobile Phones - GSM Trainer Module - GSM Repair toolbox - Workstation	Illustrate practical exercises on operation, maintenance and troubleshooting using GSM trainer units.	Arrange for industrial visits to operators. Carryout Maintenance and Troubleshooting of GSM.	
	2.3 Explain the following functional elements in GSM operations: i. Message center (MXE) ii. Mobile Service Node (MSN) iii. Gateway Mobile Services Switching center (GMSC) iv. GSM Internetworking Unit (GIU) v. Intelligent Network (IN) 2.4 Describe roaming in the GSM operation. 2.5 Explain call set, call routing and charging during roaming		- GSM Motherboard Image Analyzer			

	General Objective 3.0 Understand GSM switching system. Year 1, Term 3					
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Evaluation**
25-36	3.1 State the function of switching system 3.2 Describe the following element of switching system: i. Home Location Register (HLR) ii. Switching Centre (MCS) iii. Visit Location Register (VLR) iv. Authentication Centre (AUC) v. Equipment Identity Register (EIR)	Explain with drawing / pictures the major concepts of new generation networks	- Pictures - Manuals - WhiteBoard - Computer - GSM Trainer Unit	Carry out practical exercises on operation, maintenance and troubleshooting of the switching system using GSM trainer units.	Organise visits to operators.	

	General Objective 4.0 Understand the Base Station System (BSS)					
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Evaluation**
	4.1 Explain the operation of the base station system. 4.2 Explain the functions of the following elements in the base station system: i. Base station controllers ii. Base transceiver stations (BTS)	Discuss the operation of a base station	- WhiteBoard - Computer - GSM Trainer Unit	Carry out practical exercises on operation, maintenance and troubleshooting using GSM trainer units	Organise visits to operators.	
	General Objective 5.0 Understand Operation and Support services. Year 2, Term 2					
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Evaluation**
37-58	5.1 Explain the activities of Operation and maintenance center 5.2 Explain the uses of OSS by network operator s in operation and maintenance activities as required in GSM network.	Explain the Principle and operation of the GSM network	- WhiteBoard	Illustrate the activities of operation and maintenance centre.	Take Students to operation and maintenance centre.	
	General Objective 6.0 Understand GSM security Features					
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**

	6.1 Explain the security measures in GSM. 6.2 Explain the following	State need for security measures in GSM	- WhiteBoard - Lecture note - Writing materials			
	measures: i. Subscriber' identity authentication ii. Subscriber' identity confidentiality iii. Signaling data confidentiality iv. User data confidentiality 6.3 Explain the uses of Encryption algorithms in GSM networks. 6.4 Explain the following encryption algorithm in: i. Authentication algorithm (A3) ii. Ciphering Algorithm (A5) iii. Key generating algorithm (A8)					
	Students are to be evaluated through Assignment Test Practical Examination					

NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS MAINTENANCE CRAFT PRACTICE		
Course Title: COMPUTER SYSTEM MAINTENANCE I	**Course Code: CCS 12**	**Total Contact Hours: 36Hrs**
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 AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS MAINTENANCE CRAFT PRACTICE**						
Course: Computer System Maintenance I			**Course Code: CCS 12**		**Contact Hour: 2-4**	
Course Specification: Theoretical Content				**Practical Content**		
Week	**General Objective: 1.0 Understand the general overview of computer system and components. Year 1, Term 1**					
	Specific Leaning	**Teachers Activities**	**Resources**	**Specific Leaning Objective:**	**Teachers Activities**	**Evaluation**

1-6	Computer System and Components 1.1 With the aid of a block diagram, describe 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.	Explain using block diagram, the computer hardware configuration. Describe the input device e.g. keyboard Describe the output device 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. White board Projector Monitor printer speakers etc. Hard disk Flash disk	Illustrate hardware configuration Identify Input and output devices Identify storage devices	Demonstrate using block diagram, the computer hardware configuration. Describe the input devices e.g. keyboard Describe the output devices e.g. monitor (video Display), printer, Speakers, their types and functions. Explain the function of storage media Explain I/O device	
	General Objective: 2.0 Know the basic computer hardware maintenance tools and equipment. Year 1, Term 1					
WEEK	**Specific Leaning**	**Teachers Activities**	**Resources**	**Specific Leaning Objective:**	**Teachers Activities**	**Evaluation**

	Basic Maintenance Tools 2.1 Explain the various types and sizes of the following hand tools: i. nut drivers ii. chip extractor/inserter iii. flashlight iv. tweezers v. magnifying lens vi. torx drivers vii. screw drivers viii. soldering iron ix. part grabber or x. Lead sucker 2.2 State the functions of 2.1 above	State various types of hand tools. i. knot drivers ii. chip extractor/inserter iii. flashlight iv. tweezers v. magnifying lens vi. torx drivers vii. screw drivers viii. soldering iron ix. lead sucker x. part grabber or hemostats State the functions of 3.1 above. State the functions of the following test	Nut drivers, chip extractor/inserter tweezer, torx drivers, Screw drivers, part grabber/thermostat Whiteboard Projector Multimeter logic probe/pulser outlet tester ICs chip tester Cleaning solution, CD ROM cleaner, dusters, Vacuum cleaner brushes and swabs. Soldering Station	Identify the various components of a computer system Identify various cleaning aids: i. standard cleaner ii. contact cleaner/lubricant iii. dusters iv. brushes and swabs	Guide students to identify the various component of a computer system Demonstrate the appropriate use of various cleaning solutions: i) Standard cleaner ii) Contact cleaner/lubricant iii) Dusters iv) Brushes and swabs.	

WEEK	General Objective: 3.0 Know the various types and specifications of microprocessors. Year 1, Term 1					
	Specific Leaning Objectives:	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
7-12	Types and Specifications of Microprocessors 3.1 Define Microprocessor. 3.2 Describe the following essential features of a microprocessor: i. Data bus ii. Internal register iii. Address bus iv. Processor speed rating 3.3 Describe various types of processor e.g. 8088, 80x86(x = 1, 2, 3, 4), Pentium etc. 3.4 Describe the Microprocessor	Define microprocessors Explain the following essential features of a microprocessor: i) Data bus ii) Internal register iii) Address bus • Processor speed rating Show various types of processors e.g. 8088, 80x86 (x=1,2,3,4), Pentium variety etc State other practical uses of microprocessors	Microprocessors (variety) White board Projector Mother board (Variety) Micro Computer Trainer	Illustrate Microprocessor, its essential features and the various types of a microprocessor	Illustrate Microprocessor, its essential features and the various types of a microprocessor	

	General Objective: 4.0 Know the general features of Motherboard, the board slots, I/O devices and Interfaces. Year 1, Term 1					
	Specific Leaning Objective:	**Teachers Activities**	**Resources**	**Specific Learning**	**Teachers' Activities**	**Evaluation**
	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)	White Board Projector Mother board (Variety) Motherboards Cases (Variety) Microcomputing Trainer	Identify motherboards and its casing	Guide students to identifying the motherboard, and casing	

Week	**General Objective: 5.0 Understand the features of memory modules.**					
	Specific Leaning Objective:	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
	Memory Modules 5.1 Define memory. 5.2 Distinguish between Read/Write Memory (RWM), Random Access Memory (RAM) and Read Only Memory (ROM) 5.3 Identify the physical: i. RAM chips and ii. ROM chips 5.4 Identify the following RAM chips: i. Dual in-Line Package (DIP) ii. Single in-Line Memory Module(SIMM) iii. Dual in-Line Memory	Define memory Describe RAM and ROM Distinguish between Read/Write memory (RWM), Random Access Memory (RAM) and Read Only Memory (ROM) Show physically: i) RAM Chips ii) ROM Chips Show the following RAM Chips i) Dual in-line package (DIP) ii) Single in-line	Assorted Memory chips (Variety) Motherboard White Board Projector Computer Maintenance toolbox	Identify the memory types on the Motherboard	Guide students to demonstrate simple memory installation on a computer Guide students on how to position and install a memory on the motherboard e.g, hard disk, RAM etc	

	5.5 Explain the memory bank layout and position onthe motherboard and memory card. 5.6 Describe the selection and installation of memory Chips.	Discuss the memory bank layout and position on the motherboard and memory card Describe the selection criteria installation of memory chips.				
Week	**General Objectives: 6.0 Understand the Sections power supplies. Year 1, Term 2**					
	Specific Leaning Objective:	**Teachers Activities**	**Resources**	**Specific Learning**	**Teachers' Activities**	**Evaluation**

13-24	Power Supplies 6.1 Explain the power supply function and operation 6.2 Describe the various power supply form factor 6.3 Describe the power supply connectors 6.4 Explain the power switch connector colour codes 6.5 Explain the power supply ratings 6.6 Identify various power protection devices: i. Surge Suppressor (protector) ii. Standby Power Supply (SPS) iii. Line Conditioners iv. Uninterruptible Power Supplies(UPS)	Discuss trouble shooting power techniques using test equipment. Identity various power protection devices: i) Surge suppressor (protector) ii) Standby Power supply (SPS) iv) Uninterruptible Power Supply (UPS) v) Automatic Voltage Regulator (AVR)	Computer power supply unit Line conditioner White Board Projector Surge Protector AVR UPS	Illustrate the power supply function and its operation	Guide students to understand power supply connectors. Install a PSU Guide students on how to troubleshoot power failure in a computer system Guide Students to identify power protection devices	

GENERAL OBJECTIVES: 7.0 Understand preventive and Corrective Maintenance techniques. Year 1, Term 2						
	Specific Learning Objectives:	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
	7.1 Define preventive maintenance 7.2 Describe the following preventive maintenance i) active preventive maintenance ii) passive preventive	Discuss preventive maintenance Describe the following preventive maintenance i) active preventive maintenance ii) passive preventive maintenance	white board Projector Boards. Blower. Computer System.	Illustrate preventive maintenance	Guide students on how carryout preventive maintenance (Active and Passive)	
	8.0 Know the maintenance and Installation of storage devices. Year 1, Term 2					

	8.1 Explain various storage devices 8.2 Define hard disk and show the various capacities 8.3 Explain the unit of measuring hard disk capacity, e.g. Kilobyte, Megabyte, Gigabyte and Terabyte 8.4 Describe the following type of formatting and state the various types. i) Physical or low level ii) Logical in high level 8.5 Explain IDE drive jumper settings e.g. master, slave, single-drive	Explain storage devices and memories in a computer system Explain the way and purpose of formatting and state the various types.	Hard disk(internal & external). CD drive Computer System. Solid State Drive (Different Storage Capacity). Flash Drive.	Identify the various storage devices and memories in a computer system	Guide students to identify the various storage devices in a computer system	

	8.6 Explain the following hard disk failure: i) Incorrect drive select jumpers setting ii) ii) Loose, damaged, or reversed control cable; iii) Loose or bad power cable; iv) Bad power supply; v) Incorrect drive-type setting etc 8.7 Explain various CD drives.	Explain the jumper settings on a hard drive and how to set them into different mode of operation 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.	Hard disk (IDE & SATA) Jumper wires CD ROM White Board Projector Computer System Maintenance toolbox	Identify various CD drives. Illustrate the step by step processes of installing CD-ROM drive and hard disk	Carryout settings on a hard drive. Guide students to install CD-ROM and Hard disk.	

WEEK	General Objective: 9.0 Understand the feature & installation of simple Communication Networks. Year 1, Term 3					
25-36	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
	Simple Communications 9.1 Define Network 9.2 State types of Network e.g. LAN, WAN, INTERNET etc. 9.3 Explain Network Topology	Discuss Network Describe types of Network e.g. LAN, WAN, INTERNET etc. Discuss Network Topology	White Board Projector Computers Network cables RJ11 & RJ45(Connectors) Networking toolkit.	Illustrate Computer Network Identify various types of computer Networks. Identify Network Topology	Guide students to identify various types of computer Networks. Guide the students to build a LAN network in different topologies	
	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) Microsoft Windows Defender	Explain the power on self-test (POST). Explain the use of operating system diagnostic software to carry out preventive maintenance. Explain the use of Norton utilities, Antivirus software, microsoft etc.	White Board Projector Computer System. Computer diagnostic software.	Demonstrate the use of operating system diagnostic softwares to carryout preventive maintenance.	Illustrate how to protect computers from malwares, viruses, spywares, Trojans and worms etc	

	General Objective 11. 0 Know how to upgrade computer system. Year 1, Term 3					
	11.1 Explain computer system upgrading 11.2 Explain the forms of upgrading: Processor Motherboard RAM 11.3 Explain power supply	Reasons and limitation of upgrading Explain different forms of upgrading Mention reasons for power supply upgrading	White Board Projector Upgraded and Un-upgraded Components Power supply variety. Maintenance toolbox.	Carryout computer upgrade.	Guide students on how to carryout upgrade on a computer system e.g., processor, RAM, power supply etc	

PROGRAMME: **NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GLOBAL SYSTEM MOBILE (GSM) HANDSETS MAINTENANCE CRAFT PRACTICE**

MODULE: **DIGITAL COMPUTER ELECTRONICS**

COURSE CODE: CCS 13

CONTACT HOURS: 48 HRS

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 Global System Mobile (GSM) Handsets Maintenance Craft Practice						
Module: Digital Computer Electronics		**Module Code: CCS 13**		**Contact Hours: 48 HRS**		
Module Specification: Theoretical Contents				**Practical Contents:**		
Week	**General Objective: 1.0 Know the different number systems. Year 1, Term 3**					
	Specific Learning Objectives	Teacher/Student Activities:	Learning	**Specific**	**Teacher**	**Evaluatio**
1-12	**Number System** 1.1 Solve problems using decimal Binary, Octal and hexadecimal number systems 1.2 Explain how to convert from one numbering system to another. 1.3 State areas of application of the number systems. 1.4 Explain BCD, Excess-3 code, 7 segment display code, ASCII codes, Gray codes	**Discuss** decimal, binary octal and Hexadecimal number system with examples. Carry out simple arithmetic operations using the various number systems Convert decimal to binary numbers Convert binary to octal and check. Convert octal & hex to binary. Convert octal & hex to decimal Discuss the area of application of Number systems. Describe what codes are. Explain conversion from one code to another Mention devices that make use of seven segment display.	White board Projector			

Week	General Objective: 2.0 Know fundamentals of Boolean algebra					
	Specific Learning Objective	**Teacher/Student Activities:**	**Learning Resources**			
	2.1 Define the inverse (NOT), AND and the OR operations 2.2 State Boolean postulates 2.3 State the laws of Boolean algebra: Commutative Law, associative law Distributive law, negation law, Redundancy law.State De'Morgan 's theorem.	Discuss the AND OR & NOT Functions. Outline the Boolean postulates State the laws of Boolean Algebra. State D'Morgans theorem. Solve some examples with the laws of Boolean Algebra and D'Morgans theorem.	White board Projector			

	General Objective: 3.0 Know Computer Logic gates. Year 2, Term 1					
Week	**Specific Learning Objective**	**Teacher/Student Activities:**	**Learning**	**Specific Learning**	**Teachers'**	**Evaluation**
13-36	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.	Describe the symbols of a 2-input AND & OR gates and a NOT Gate. Describe the NAND, NOR XOR XNOR representation. Explain Truth Table Discuss the truth table for 2-input AND & OR gates and a NOT	White board Projector Logic trainer or logism software Computer systems (for logism)	Illustrate 2-input AND and OR gates and NOT gates operation	Carryout experiment to illustrate the AND, OR and NOT operations.	
	General Objective: 4.0 Know Common Digital System Building Blocks					
	Specific Learning Objective	**Teacher/Student Activities:**	**Learning**	**Specific Learning**	**Teachers'**	**Evaluation**
	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	Discuss the difference between combinational logic and sequential logic. Explain how a latch is realized from logic gates and its truth-table. Explain how a flip is realized from logic gates. Discuss edge triggering and state the functions of D, T & JK flip-flops	White board Logic module	Illustrate combinational and sequential logic circuits	Setup an experiment to guide the students to understand combinational and sequential logic circuits.	

	General Objective: 5.0 Know the nature and characteristics of digital ICs. Year 2, Term 3					
37-48	**Specific Learning Objective**	**Teacher/Student Activities:**	**Learning Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**

	5.1 Explain digital IC packages. 5.2 Identification of digital IC pins. 5.3 Distinguish between digital and analogue ICs. 5.4 State the logic families 5.5 Explain the constructional features of TTL ICs. 5.6 State the TTL numbering schemes. 5.7 State the operational characteristics (Power ratings, voltage ratings etc.) of TTL devices. 5.8 Explain the constructional features of CMOS ICs. 5.9 State CMOS numbering schemes 5.10 Explain operational characteristics of CMOS devices.	Explain IC packages such as single in line packages, dual in line packages, etc Explain how to identify the pins of a digital IC. 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. Explain the characteristics of the TTL devices Show the constructional features of CMOS and their numbering Explain the characteristic of the CMOS devices.	• Textbooks • Assorted logic ICs • Digital multimeters • Practical manuals	Identify digital ICs and their pin configuration	Guide students to identify digital ICs and their pin configurations	

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

MODULE: COMPUTER SYSTEMS MAINTENANCE II.

MODULE CODE: CCS 22

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 AND GSM MAINTENANCE CRAFT PRACTICE**						
COURSE: COMPUTER SYSTEM MAINTENANCE II		**Course Code: CCS 22**		**Contact Hours: 36 HRS**		
Course Specification: Theoretical Content			Practical contents:			
Week	General Objective: 1.0 Know the techniques of building a Computer System. Year 1, Term 1					
1-12	Specific Learning Objectives	Teachers' Activities	Resources	**Specific Learning Outcome**	**Teachers Activities**	**Evaluation**
	1.1 State the various components in a system unit. 1.2 Explain the process of assembling a computer system 1.3 Explain safety precautions involved in troubleshooting and maintenance	Explain various components in a system Unit. - Explain the safety measures in assembling a computer system	White board projector Desktop computer Laptop computer Computer maintenance toolbox Electrostatic mat. Electrostatic wrist strap	Identify the various components of a computer system Disassemble and re-assemble a desktop and a laptop computer	Guide students to identify the various component of a computer system Guide students to disassemble and re-assemble both desktop and laptop computers Guide students to CLONE a computer system and install an OS	
	General Objective: 2.0 Know the general features operation, fault –finding and repairs of a typical Power Supply Unit					
	Specific Learning Objectives	Teachers	Resources	**Specific**	**Teachers**	**Evaluation**

	2.1 Explain the principle of operation of a switch 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 switch Mode (SMPS) Explain various parts of a PS pack	PS pack (good) PS pack (faulty) Computer maintenance toolbox Multimeter	Illustrate the principle of operation of a switch Mode Power Supply Unit (SMPS).	Guide students to illustrate the principle of a switching mode Power Supply Unit (SMPS). Guide the students observe the parts of a power supply unit. Carryout troubleshooting and repairs on a faulty PSU	

	ii) rectifiers and filters iii) higher frequency switch iv) step-down switching transformer v) low voltage rectifier and filters vi) control circuit.					
General Objective: **3.0 Know the general features, and operation of Visual Display Unit (Monitor). Year 1, Term 2**						
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Evaluation**
13-24	3.1 Explain the principles of operation of LCD 3.2 Explain the principles of operation of LED 3.3 Explain how to troubleshoot and repair some LCD display problems 3.4 Explain how to troubleshoot and repair some LED display problems	Discuss the construction and principle of operation of LCD and LED displays	White board LCD VDU LED VDU System Unit Computer maintenance toolbox Multimeter	Identify LED and LCD displays Troubleshoot common problems associated with LED & LCD displays	Guide the students to identify LCD and LED displays. Dismantle the displays and observe the features. Carryout some troubleshooting and maintenance activities on LCD and LED monitors	
General Objective: 4.0 Know the principles of operation of printers						
	Specific Learning Objective	**Teachers Activities**	**Resources**	**Specific Learning**	**Teachers Activities**	**Evaluation**

	4.1 Explain the principles of operation of printers 4.2 Explain types of printers, e.g. Laser, Dot- matrix, Inkjet, etc. 4.3 Explain various parts of a printer	Highlight advantages of various types of printers	Whiteboard Projector Printers (variety)	Illustrate the principles of operation of printers and types of printers Identify various parts of a printer. Identify and clear common errors associated with printers.	Guide students to carryout simple operation on printers and identify the various parts of a printer Guide students to change cartridge and refill printer ink. Guide students to identify and correct common errors in printers.	
General Objective: 5.0 know more about Motherboard and memory resources. Year 1, Term 3						
	Specific Learning Objective	**Teachers Activities**	**Resources**	**Specific Learning**	**Teachers Activities**	**Evaluation**
25-36	5.1 Describe system resources: interrupt request channel, direct memory access, IO port address	Explain the following system resources, interrupt request channel, direct memory access, IO port address	White Board. Charts, PC loaded with Presentation Projector	Identify the various system resources	Guide students on how to identify system resources	

	5.2 Explain system memory layout. 5.3 Explain the parity checking techniques.	Explain the following system memory layout: Base Memory Upper Memory Area (UPA) Higher Memory Area (HMA) Extended Memory Area (XMA) Expanded Memory Area Explain the parity checking techniques: i. Odd parity ii. Even parity				

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

MODULE: Introduction to Computer Networks Module Code: CCS 20 Contact Hours: 36HRS

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. Year 1, Term 1					
	Specific Learning Outcome	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Evaluation**
1-12	1.1 Define Computer Network 1.2 Explain the needs for Computer Networks 1.3 Outline the applications of computer networks	Discuss Computer Networks. Discuss why we need computer networks. Discuss some key areas where computer networks can be used, eg banks, business organizations, etc.	White Board Charts Networked PCs loaded with Presentation software package and connected to multimedia Projector Diagrams showing systems connected together.	Illustrate Computer Networks.	Guide students to illustrate with diagrams how computers can be connected together	
	General Objective: 2.0 Know the types of Computer Networks					

	2.1 Explain Computer Network configurations. 2.2 Distinguish between peer to peer and server based networks. 2.3 Explain Network topologies such as: (i) Star (ii) Bus (iii) F 2.4 Explain the advantages and disadvantages of the topologies in 2.3 above.	With the aid of diagrams, explain local area network (LAN), wide area network (WAN), metropolitan area network (MAN) etc. Explain with diagrams the different types of topologies. Clearly explain why one topology is preferred over the other.	White Board. Charts, Networked PCs loaded with Presentation software package and connected to multimedia Projector	Identify types of Computer Network	Guide students to identify various computer Networks Demonstrate with diagrams local and wide area networks.	
	General Objective: 3.0 Know the various Network components and their uses. Year 1, Term 2					

13-24	3.1 Explain network components. 3.2 Explain the functions of the following: i) Nodes ii) Network Interface cards iii) Hubs iv) Switches v) Bridges vi) Repeaters vii) Routers 3.3 Explain how to use the components in 3.2	Discuss clearly the use of each network components in a network.	Whiteboard Nodes Network Interface cards Hubs Switches Bridges Repeaters Routers	Identify the various network components	Guide students to identify the various network components	
	General Objective: 4.0 Know Network cables and their uses					
	4.1 Explain the common Network cables such as: i) Unshielded Twisted Pair (UTP) ii) Coaxial cable iv) Fibre Optics, etc. 4.2 Explain the applications of the cables in 4.1 4.3 Describe cable crimping	Discuss the types of cables used in Networks and the situations where they are used. Discuss the difference between the various cable categories and their application. Discuss types of cable connectors Explain how to crimp cables for networking	* Assorted network cables * Coaxial cable *Whiteboard *RJ11 connector *RJ45 connector * BNC connectors Networking Toolkit	Identify the common Network cables Illustrate cable crimping	Guide students to identify the common Network cables Guide students to perform cable crimping with both RJ11 and RJ45 connectors	

	General Objectives: 5.0 Understand the process of building simple Computer Network. Year 1, Term 3					
25-36	5.1 Explain the minimum components required to build a simple Computer Network 5.2 Explain how to build up a simple network 5.3 Explain how to apply IP address in networks 5.4 Explain the effect of the following on network performance: i) Cabling ii) Count iii) Distance	Discuss clearly the basic components that can form a network Discuss how many modes can be connected to a hub and the longest distances possible. Discuss IP addressing: Kinds (IPv4 and IPv6), static and dynamic IP addressing, subnetting. Discuss how count, cable and distance affect network performance.	Computers Cables Hub Switches Routers Networking toolkit Network analyzer (software and hardware)	Identify the minimum components required to build a simple Computer Network Understand how to build simple computer networks	Guide students to identify the minimum components required to build a simple Computer Network Guide students to crimp and test network cables Guide students to build a simple LAN Guide students to interconnect two separate LANs using a router and connect to the internet.	

	General Objective: **6.0 Know the use of the Internet**					
	6.1 Explain the use of the Internet and its applications 6.2 Explain different internet terminologies:	Discuss clearly the use of internet in communication. Discuss with examples World Wide Web Internet Protocol, e.g. http, TCP / IP, Unified Resource Locator (URL), Internet browsers.	Computers connected to the internet. Whiteboard Projector	Illustrate the use of the Internet.	Guide students on the use of Internet	

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

MODULE: COMPUTER APPLICATION PACKAGES

MODULE CODE: CCS 21

CONTACT HOURS: 48 HRS

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.

6.0 Understand Presentation packages

PROGRAMME: ADVANCED NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GSM MAINTENANCE CRAFT PRACTICE						
Module: Computer Application Packages			**Module Code: CCS 21**		**Contact Hours: 1-3**	
Module Specification: Theoretical Content				**Practical Content**		
Week	**General Objective: 1.0 Know common application packages. Year 1, Term 1**					
1-12	Specific Learning Objective	Teacher Activities	Learning Resources	**Specific Learning Outcome**	**Teachers Activities**	**Evaluation**

Application Packages 1.1 Explain application packages. 1.2 List common packages: word processing, spread sheet, presentation, Database Management System (DBMS), statistical, graphics, and expert system. 1.3 Name some packages in each type listed in 1.2 above. 1.4 Differentiate among system software, program generators and application packages. 1.5 Explain the modes of acquisition of packages: in-house, purchase, lease, etc. 1.6 State the criteria for packages acceptability: good documentation, user-friendliness, efficiency, appropriateness, etc.	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.	Computer System MS Office SPSS PC + Corel draw Marker, White board, Recommended textbooks, Lecture Notes. PC (with relevant application packages installed), Multimedia Projector Projector Screen Internet connection	Identify the modes of acquisition of packages: in-house, purchase, lease, etc. Install software Applications, Web Applications and Apps downloaded from App Store or other reliable sources	Identify the modes of acquisition of packages: in-house, purchase, lease, etc. Demonstrate how to Install and work with Softwares and Web Application Guide students on how to Install and work with Packages Guide the student on how to install and work with an App downloaded from App Store	

	2.0 Understand Word Processing Packages.					
	Word Processing Package. 2.1 Define Word processing packages. 2.2 State the uses of word processing packages. 2.3 List some examples of word processing packages	Define 'word processing packages' and state their uses	Marker, White board, Recommended textbooks, Lecture Notes. PC (with relevant application packages installed), Multimedia Projector Projector Screen	Create a word document and Carryout basic operations in Microsoft word Create tables and insert objects/images and graphics in word Perform document formatting in word	Guide students to perform some basic operations in word i. create and save files **i.** carry out basic formatting operations iii. Exit the word Demonstrate how to create tables, insert objects and graphics, change margins, paper size, or the orientation, remove page	

	2.3 Explain menus. 2.4 Explain how to: • 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 2.5 Explain how to • reuse text and graphics • Compare Auto-Correct and Auto-Text • Insert Text and graphics by using:(i) Auto-Correct and (ii) Auto-Text. 2.6 Explain document editing: • Check spellings and grammar • Look up words in the Thesaurus. 2.7 Format Character and Paragraph: • Change Font, Font size and other Formats, underline, Bold etc. • Change the Preset (Default) Character and Format paragraph • Perform Centralizing, justification, Alignment and Indenting of Text • Set and clear Tab stops; line spacing and perform adding of Boarders and Shading.	Discuss the term 'menu'. Discuss 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.	Marker, White board, Recommended textbooks, PC (with relevant application packages installed), Multimedia Projector Projector Screen Interactive board Kyan 6-in one Interactive projector	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 centering, alignment and indenting of text and set/clear tap stop, line spacing, add borders and shading.	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 centering, alignment and indenti	

	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 margins, 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. …				

	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 • Perform copy and paste of document	Demonstrate border and shading to the contents of a frame. and wrap around Show how to import and edit graphics Show how 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				

	3.0 Know Spread Sheet (Microsoft Excel). Year 1, Term 2					
13-24	3.1 Spread Sheet. 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. 3.2 Edit a Worksheet 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. 3.3 Explain how to edit a worksheet Link cells and worksheets. Create a document using formula and insert the data. Insert the formula for calculating data. Use the summation tool.	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.	Ms Office (Excel) Computer sets Projector White board Projector Screen Magic board	Create a spread sheet document Open a spread sheet document Carryout some key spreadsheet operations Carryout some key spreadsheet operations using cell references	Guide students to open, save and close workbooks Guide students to carry out the following activities in Excel: select cells for a variety of purposes; copy and move data; change the column width or row height; create simple formulas and use common built-in functions. Merge and unmerge cells, cut, copy, and paste data Guide students to use accounting functions in a workbook Guide students to carryout	

	3.4 Explain how to edit and Create a payroll. 3.5 Choose type and category of graph. 3.6 Create and print graph. 3.7 Format a worksheet (number, date, currency format). • Change paper format, set margin (Expand and reduce). 3.8 Merge cells; Insert borders; Align text; remove and insert gridlines. 3.9 Customize the toolbar.					
	4.0 Know Statistical and Graphics Packages. Year 1, Term 2					

	Statistical and Graphics Packages 4.1 Explain a statistical Packages. 4.2 Apply a statistical package to solve a given problems. 4.3 Explain graphic packages. 4.4 Apply a graphic package to solve problems.	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		Demonstrate the concept of Variable Use computer system to generate data	Demonstrate the concept of Variable Illustrate how to generate data online Illustrate how to Transform Data Demonstrate how to create different statistical tables and charts Introduce students to graphic package tools	
Week	**5.0 Know Database Application Package. Year 1, Term 3**					
25-36	Specific Learning Objective	Teacher Activities	Learning Resources	**Specific Learning Outcome**	**Teachers Activities**	**Evaluation**

	5.1 Explain Database Application Package. • Define Database Management System (DBMS). • List the different types of DBMS and state their relationship. • State the application of DBMS.	Explain what is Database Management System identifying the different types of DBMS and their applications.	Computer Whiteboard Lesson Note	Apply a DBMS to Create, Save, and Retrieve Personnel information Find and sort data using the records above: Create queries and forms Create personnel report using the records above. Print personnel report. Explain primary	Demonstrate how to Create, Save and Retrieve information from a database. Illustrate how to carry out the following database operations: Find and Sort Data Work with Queries and Forms Demonstrate how to create Reports and Print Reports	

	5.2 Explain the structure of Database • 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	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				
	5.3 Explain how to work with database files • 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	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.				

	5.4 Explain how to search for records • 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	Define the terms: 'Fixed' and 'Variable' length recodes; '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				

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

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

DURATION: 216 HRS

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: ADVANCED NATIONAL TECHNICAL CERTIFICATE IN COMPUTER AND GSM MAINTENANCE CRAFT						
Course: Global System of Mobile Communication (GSM) Maintenance and Repairs	**Course Code: CCS 22**	**Contact Hours: 2-4**				
Course Specifications: Theoretical Contents			**Practical Content**			
WEEK	**General Objective: 1.0: Know the basic operations of GSM communication system. Year 1, Term 1**					
1-12	**Specific Learning Objectives**	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Evaluation**
	1.1 Explain the following terms: a. Wave Propagation b. Cellular c. GSM communication d. Repeater stations and CDMA communication e. Satellites f. Fibre optics 1.2 List and explain the basic features of a mobile phone, e.g. SMS, GPS, WAP, GPRS, 3G, etc.	Discuss using charts geostationary and low-earth-orbit (LEO) Describe different types of wave propagation and their frequencies List the uses and limitations of the features	Whiteboard Charts Projector			
	General Objective: 2.0: Know the different types of Mobile Phones and the Service.					

	2.1 Explain the types of mobile phones in relation to their bandwidth 2.2 List and explain different types of a mobile phone (straight, flip and slides) 2.3 List and explain the functions of different types of mobile phone accessories	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 Show various types of mobile phones using objects and pictures Show various types of mobile phones accessories	GSM handsets Whiteboard Charts Handsets Charts Accessories	Identify the different types of mobile phone, its accessories and functions	Guide students to identify various types of mobile phone accessories	

	2.4 Explain the main menu and submenu functions of different mobile phones, e.g. Phone Book, Message, Call Register, etc. 2.5 Identify the major Service Providers in Nigeria and their service codes, e.g. Customer Service, Checking Balance, Recharging, Message Centre, etc.	Operate different handsets to compare their menu functions List Service Providers and their service codes	Charts Various Handsets Whiteboard Charts UMT Dongle Cm2MTK Octopus Thermal camera Fluke multimeter	Identify the main menu and submenu functions of different mobile phones	Guide students on the use of main menu and submenu functions of different mobile phones Guide students to use software and codes for fault finding and repairs	
WEEK	**General Objective: 3.0: Understand the essential components of GSM Systems and their functions. Year 1, Term 2**					

13-36	3.1 Describe the components of GSM System Mobile Station (MS), Base Station, Mobile Switch Centre 3.2 Describe software and hardware components of GSM phones 3.3 Explain the functions of the essential parts of mobile phones • CPU • SIM Card • SIM Card Connector • Keyboard • Battery • Power supply Unit • Earpiece • Memory, etc. 3.4 List and explain some essential websites for	Field trip to Service Provider Explain and highlight differences between soft and hardware components of GSM Use block diagram to show the essential parts of GSM system and explain the functions of each block	Fonekong scope DC power supply Handsets Charts Mobile Phones (Assorted) GSM Screens (Assorted) GSM Screen Sensor (Touch screen) Mouth piece (Assorted) Ear Piece Terminal (Assorted) Memory Card Slot (Assorted) Sim Slot (Assorted) Battery Terminals (Assorted) Ear Piece (Assorted)	Illustrate the components of GSM System Mobile Station (MS), Base Station, Mobile Switch Centre Identify software and hardware components of GSM phones	Guide students to identify the components of GSM System Mobile Station (MS), Base Station, Mobile Switch Centre Guide students to resolve common hardware problems	

	Service Providers and mobile phones manufacturers	browse their websites	Manuals			
WEEK	**General Objective: 4.0: Understand the fault finding and repairs of mobile phones. Year 1, Term 3**					
	4.1 Explain 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 4.4 Explain the precautions to be observed during fault finding and repairs 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	Discuss the safety rules as described in the manufacturers manuals Explain the importance of turning off a mobile phone when trouble-shooting, charging battery or removing Sim Card and other precautions. Describe component problems in software and hardware mobile phones	Manuals GSM Handset JBC Soldering station. Quick rework station (spiral 2008). Quick rework station (straight 361D). PCB holder (MIJING K23). Soldering paste. (138,183,217 degrees). Soldering flux. Rosin. Foam spray. Rebuilding utensils (Iphone series, Mediatech Series, MMC Series, UFS Series).	Identify maintenance and repair tool and use it to carry out repair work Perform the following on GSM phones: - Troubleshooting, - Dismantling, - Assemble and - Test Perform fault finding using software.	• Demonstrate and guide students to solve common hardware problems	

Recommended Textbooks:

1. Online Subscription to an online e-library vendor, online articles and online journals
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
5. C. S. French, "Computer Science", ELBS,

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).

LIST OF EQUIPMENT FOR NTC/ANTC IN COMPUTER AND GSM MAINTENANCE CRAFT PRACTICE
(MINIMUM REQUIREMENT PER CLASS OF 40 STUDENTS)
TOOL LIST/EQUIPMENTS

S/NO	HARDWARE TOOLS	Minimum Quantity	Quantity Available	Additional Quantity Required
1.	Electronic precision set (screwdrivers)	40		
2.	Soldering station	40		
8.	Cutting Pliers	40		
10.	Circuit Board Holder	40		
12.	Magnifier	20		
	LEAD SUCKER	40		
	Computer Maintenance Toolbox	20		
	Networking Toolbox	20		
	TORX DRIVER SETS	20		
	NUT DRIVER (VARIETIES)	20		
	CHIP EXTRACTOR/INSERTER (VARIETIES)	20		
2.	IC TESTER	20		
	TWEEZERS	20		
	Cm2MTK	20		
	Octopus	20		
	Miracle Box	20		
	GSM Repair toolbox	40		
S/NO	**SOFWARE TOOLS**	**Minimum Quantity**	**Quantity Available**	**Additional Quantity Required**

	Operating System Software (Windows and Linux)	Make Available		
	Microsoft Office (Latest Version)	Install on all		
	CorelDraw	Install on all available		
	Statistical Package (SPSS)	Install on all		
	Network Analyzer Software Tool	Install on all available		
	DIAGNOSTIC SOFTWARES	Install on all available		
	Antivirus Packages	Make		
	Multisim	Install on all		
	Circuit Construction Kit	Install on all		
	MPLab	Install on all		
	UMT Dongle	Install on all		
	Logisim	Install on all available		
	ISIS Proteus	Install on all		

Measuring Instruments				
1.	Multimeter (Analog and Digital)	20 Each		
3.	Dual Channel Oscilloscope	20		
4.	LOGIC PROBES	20		
	VOLTMETER (Analog)	40		
	OHMMETER	40		
	Wattmeter	40		
	Galvanometer	40		
	AMMETER (Analog)	40		
	Fluke Multimeter (Auto range)	20		
Equipment				
1.	Unlocking Box with Cables	5		
2.	Rework Station	20		
	Heat Gun	5		
	Flex bonding machine	1		
	WHITEBOARD	1per lab&class		
	PROJECTOR	2per lab&		
	PUBLIC ADRESS SYSTEM (LOUDSPEAKER &	2		
	SMARTBOARD	1		
	SIGNAL GENERATOR	20		
	Variable DC POWER Supply Unit	20		
	WINDING MACHINE	10		
	PCB etching machine	5		
	Uninterruptible Power Supply (UPS)			
	Automatic Voltage Regulator			

	Surge Protector			
	TRANSFORMERS (STEPDOWN)	20		
	FM & AM RF SIGNAL GENERATOR	1		
	Computer Systems	40		
	Laptops	10		
	Button Phones	Variety		
	Smartphones	Variety		
	Tablets	10		
	Notebook	10		
	GSM Trainer Module	10		
	Microcomputer Trainer			
	Computer cases	Variety		
	Printers	Variety		
	Plotter Printer	1		
	SIGNAL TRACER	20		
	AM RADIO RECEIVER	5		
	FM RADIO RECEIVER	5		
	AM & FM TRAINERS	5		
	FAULTY Public Address System EQUIPMENT	2		
	Mini drilling machine	20		
	Mini vice with clamp	20		
	DESKTOP MOTHERBOARDS (VARIETIES)	5 each		
	LAPTOP MOTHERBOARDS (VARIETIES)	5 each		
	EXPANSION CARDS (ASSORTED)	10		
	FLASH DRIVE	40		
	HARD DISK DRIVE	20		
	ETHERNET SWITCHES AND ROUTERS BOTH WIRED	5 each		
	KEYBOARD (VARIETIES) FOR BOTH LAPTOP&	10 each		
	MOUSE (VARIETIES)	10 each		

	MONITOR (VARIETIES) BOTH GOOD & FAULTY	5each		
	PRINTER (VARIETIES)	1 each		
	PHONE SPEAKER (VARIETIES)	20		
	BLOWER	2		
	MICROPROCESSORS (VARIETIES)	10 each		
	COMPUTER RAM FOR BOTH DESKTOP & LAPTOP	5 each		
	COMPUTER POWER SUPPLY UNIT (GOOD &	5each		
	AC & DC APPLIANCES	Assorted		
	COLOUR CODED TRANSFORMER	10		
	GUITER	2		
	GSM Laminating Machine with de-bubbler	1		
	Booster/ac adaptor	10		
	Digital Microscope	1		
MATERIALS / CONSUMABLES				
	CONDUCTORS	ENOUG		
	INSULATORS	ENOUG		
	CELLS	ENOUG		
	Screen Flex for GSM and Monitors (assorted)	5 EACH		
	LCD Module Repair Tools	10		
	BATTERIES (VARIETIES)	ENOUG		
	CONNECTORS	ENOUG		
	BULBS (VARIETIES)	ENOUG		
	CAPACITORS (VARIETIES)	ENOUG		
	RESISTORS (VARIETIES)	ENOUG		
	INDUCTORS	ENOUG		
	BREADBOARD	40		
	MAGNETIC BAR (PERMANENT)	40		
	IRON FILLINGS	ENOUG		

	COPPER WIRE	ENOUG		
	LAMINATED CORE	ENOUG		
	SEMI CONDUCTOR DIODES	ENOUG		
	RECTIFIER ICs	10		
	TRANSISTORS (NPN, PNP & POWER TRANSISTOR)	ENOUG		
	HEAT SINK	10		
	LED INDICATORS (LED VARIETIES)	ENOUG		
	ZENER DIODE	ENOUG		
	RECTIFIER DIODE	ENOUG		
	WATER BOWLS	5		
	TURNING FORK	5		
	SWITCHES (VARIETIES)	ENOUG		
	VERO BOARDS	ENOUG		
	LEAD (leaded and unleaded)	ENOUG		
	COMPACT DISC	1 PACK		
	CLEANING SOLUTION	ENOUG		
	BRUSHES AND SWABS	ENOUG		
	JUMPER WIRES (1.0mm and 0.1mm)	ENOUG		
	Aluminium Foil TAPE	2		
	Soldering paste (138,183,217 degrees)	2 CANS		
	Drier	2		
	Methylated Spirit	5		
	Lamp	5		
	Ferric chloride	5 bottles		
	Etch resistant pen	20		
	Transparent paper	2 rolls		
	GSM Screens (Assorted)	40		
	GSM Screen Sensor (Touch screen)	40		
	Mouth piece (Assorted)	40		

	Ear Piece (Assorted)	40		
	Kyan 6-in-1 interactive projector	4		
	Charging Port (Assorted)	40		
	Charging IC (Assorted)	40		
	Battery Terminals (Assorted)	40		
	Sim Slot (Assorted)	40		
	Memory Card Slot (Assorted)	20		
	Ear Piece Terminal (Assorted)	40		
	Sim cards (Assorted)			
	Solid State Drives (different storage capacity)	5		
	External HDDs	5		
	Projector Screens	Each lab		
	Thermal Camera	2		
	Fonekongscope DC Power Supply Unit	10		
	JBC Soldering Station with extra bits	10		
	Quick Rework Station spiral (model2008)	10		
	Quick Rework Station straight (model 861D)	10		
	MIJING K23plus PCB holder	40		
	Rosin	ENOUG		
	Foam Spray	20		
	Reballing Stencils (IPhone series, mediatek series, Qualcom series, EMMC Series, UFS Series, SAMSUNG SERIES).	40 EACH		
	Prying tools	40		
	Scaping tools	40		
	UV Lamp	40		
	PCB Cleaning tools (brush,COOTON WOOL,ANTI STATIC			
	Board views (Borneo, wuxinji)			
	Screw drivers (2nul, sunshine)	40		
	Tweezers (sunshine, Relife) straight and curved	40		

	Trinocular Microscope with 4k camera and auto zoom			
	NAND Programmers			
	EEPROM Programmers			
	Practice Board for Iphone and Android series			
	Working board for Iphone and android series			
	Insulated heating mats			

EXPERT CRITIQUE COMMITTEE

S/NO	FULL NAME	FULL ADDRESS	e-MAIL
1.	Abubakar Aliyu Abba	Department of Computer Engineering, Federal Polytechnic, Bali, Taraba State	abubakaraliyuabba@gmail.com
2.	Engr. Mustapha Habu	Engausa Global Tech Hub, Tech Incubation Center, Kano	ringims@gmail.com
3.	Adesola Abimbola Rosemary	Computer Department GTC, Ado-Ekiti, Ekiti State	bimborosemary@gmail.com
4.	Jamilu Shuaibu	20, Dutse Road, Badarawa Kaduna	Shuaibujamilu29@gmail.com
5.	Prof. Idris M. Bugaje	Executive Secretary N.B.T.E., Kaduna	es@nbte.gov.ng
6.	Engr. A D K Muhammad	Director, VT&SD N.B.T.E., Kaduna	adkmuhammad@gmail.com
7.	Musa M. Isgogo	Director, Curriculum N.B.T.E., Kaduna	dugujiisgogo@gmail.com
8.	Engr. S M Yusuf	N.B.T.E., Kaduna	smohammedyusuf@yahoo.com
9.	Abdulkarim B. Shani	N.B.T.E., Kaduna	abdulkarimbshani@gmail.com
10.	Muhammad Bilyaminu Musa	N.B.T.E., Kaduna	mahoganybm@gmail.com

VERIFICATION COMMITTEE

S/NO	FULL NAME	FULL ADDRESS	e-MAIL	PHONE NO.
1.	Abubakar Aliyu Abba	Department of Computer Engineering, Federal Polytechnic, Bali, Taraba State	abubakaraliyuabba@gmail.com	08069339965
2.	Balogun Stephen (Mr)	NABTEB	balogunstephen@gmail.com	08064314605
3.	Mbaugu Uche (Mrs)	Federal Ministry of Education		
4.	Kabiru Ibrahim A.	Hussaini Adamu Fed. Polytechnic Kazaure	Ibrahimkb.76@gmail.com	08023771055
5.	Muhammad Salisu Mohammed	Industrial Training Fund	Emmsquare.ms@gmail.com	08061570262
6.	Auwal Garba Usman	Engausa Global Tech Hub, Tech Incubation Center, Kano	Auwalu2004@gmail.com	08039122288
7.	Jamilu Shuaibu	JZ Technologies LTD	shuaibujamilu2a@gmail.com	08032818219
8.	Oludele-Ajiboye, Helen T. (Mrs)	Federal Ministry of Education	helenoludele@gmail.com	07055210005
12.	Abdullahi Muhammad Naim	N.B.T.E., Kaduna	abdullahinaeem@gmail.com	08060617356