PROGRAMME: **NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**

COURSE: WORKSHOP SAFETY

COURSE CODE: CHT 101

CONTACT HOURS:

GOAL: This module is designed to provide the trainees with relevant workshop safety as it relates to the plumbing profession

GENERAL OBJECTIVES: On completion of this module trainees should be able to:

1.0 Understand the role that safety plays in the construction industry

2.0 Understand the necessary safety procedures

3.0 Understand how unsafe acts and conditions causes accident and ways of handling them on site

4.0 Understand the use of fire fighting equipment

5.0 Understand the application of first aid.

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: WORKSHOP AND SITE SAFETY			**Module:**		**Contact Hours:**	
Course Specification: Theoretical/Practical Contents						
WEEK	**General Objective 1.0: Understand the role that safety play in construction industry**					
1-4	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**
	1.1 Describe the meaning of workshop job-site safety 1.2 Explain the appropriate safety precautions to trace around common job hazards 1.3 Identify job site hazardous work specific to plumbers	- Explain the concept of safety, workshop and site - Discuss the appropriate safety precautions on jobs to prevent hazards i.e workshop and sites - Explain possible job hazards peculiar to plumbers	Charts Textbook Chalkboard	1.4 Demonstrate the use and care of appropriate personal protective equipment (PPE) 1.5 Properly put on and remove personal protective equipment	- Guide students to demonstrate the use and care of appropriate personal protective equipment (PPE) - Guide students put on and remove personal protective equipment	- Protective Equipment - Safety Equipment
	General Objective 2.0: Understand the necessary safety procedures					
	2.1 Describe safe lifting procedures 2.2 Describe safe work procedures around electrical equipments 2.3 Describe safe behaviour on and around ladders and scaffolds 2.4 Describe the clock in and clock out process	- Explain safe lifting procedures - Discuss safe work procedures around electrical equipment - Explain safe behaviour on and around ladders and scaffolds	Charts Textbook Chalkboard	2.5 Demonstrate the safety procedures for lifting heavy objects 2.6 Demonstrate proper use of ladders	Guide students to demonstrate safety procedures for lifting heavy objects Explain through demonstration the proper use of ladder	Cranes (workshop) Ladders Scaffolds

	2.7 Explain how to work safely in and around a trench	- Explain the clock in and clock out process - Discuss safety precaution in and around trenches		2.8 Demonstrate the clock in/clock out	Demonstrate the process of clocking in and clocking out Supervise student demonstration of clocking in and clocking out procedures	
	General Objective 3.0: Understand how unsafe acts and conditions causes accidents and ways of handling them on sites					
	3.1 Describe the common unsafe acts and unsafe conditions that cause accidents 3.2 Describe how to handle unsafe acts and unsafe conditions 3.3 Explain how the cost of accidents affects every one on site	- Explain the various causes of accident - Discuss necessary precautions needed to avoid accident - Explain the implication of accident: i) Loss of time ii) Injury iii) Disruption of work iv) Loss of man hour v) Loss of life	Charts Textbooks Chalkboard	Demonstrate safe acts	Guide students to demonstrate safe acts e.g. proper handling of tools	Tools
	General Objective 4.0: Understand the use of fire fighting equipment					
	4.1 Apply the use of : - Sand bucket - Fire extinguishers, etc. 4.2 Describe the correct locations of fire fighting equipment	- Explain the use of fire fighting equipment - Discuss the use of these equipment to prevent fire out break - Explain goal of fire fighting equipment and its importance	Sand bucket Fire extinguishers Charts Chalkboard Posters	Demonstrate the use of fire fighting equipment such as sand bucket, fire extinguishers	Guide students to demonstrate these equipment	Sand bucket, fire extinguishers

	General Objective 5.0: Understand the application of first aid					
	5.1 Explain the meaning of first aid 5.2 List items in a first aid box 5.3 Administer drug in the first aid box 5.4 Apply bandages 5.5 Call for help during emergency	- Discuss the concept of first aid - List and explain items found in first aid box - Explain the use of each drug in the first aid box - Explain the process of calling for help	Fully kitted first aid box Charts Chalkboard Posters		- Demonstrate the treatment of simple injury in the workshop - Guide student in administration of artificial respiration - Demonstrate the application of bandages	Fully kitted first aid box

PROGRAMME: **NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**

COURSE: PLUMBING PRACTICE

COURSE CODE:

CONTACT HOURS:

GOAL: This module is designed to acquaint the trainees with the plumbing profession

GENERAL OBJECTIVES: On completion of this module trainees should be able to:

1.0 Understand the plumbing profession in relation to the construction industry

2.0 Know plumbing codes and their purposes

3.0 Understand plumbing trade licensing processes and procedures

4.0 Know customers expectations in the plumbing profession

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: PLUMBING PRACTICE			**Module:**		**Contact Hours:**	
Course Specification: Theoretical/Practical Contents						
WEEK	**General Objective 1.0: Understand the plumbing profession in relation to the construction industry**					
	Specific Learning Outcome	**Teachers Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**
	1.1 Explain the history of the plumbing profession 1.2 Identify the responsibilities of peoples work in construction industry 1.3 State the personal characteristics of a professional 1.4 Discuss the stages of progress within the plumbing profession and its positive impact on society	- Explain the history of the profession and how it fits into construction industry - Identify trades and professions in construction industries and explain their responsibility - Explain characteristics of plumbing profession - Explain stages of plumbing profession - Discuss the importance of plumbing profession to the society	Chalkboard Textbook Charts			
	General Objective 2.0: Know the plumbing Codes and their purposes					
	2.1 Describe the model and local plumbing codes and their purposes 2.2 Explain the procedure for modifying plumbing codes 2.3 Explain basic regulations guiding the construction profession	- Guide students to identify plumbing codes and their uses - Guide students to explain the mode for modifying plumbing codes - List and explain the basic regulation guiding the construction profession	Chalkboard Charts Code pamphlet			

	General Objective 3.0: Understand plumbing trade licensing process and procedure					
	3.1 Describe the employment opportunities in plumbing profession 3.2 Discuss licensing process in Nigeria: - Apprenticeship - Classroom training, etc.	- List job opportunities student might pursue in the profession - Complete web based research paper on employment opportunities - Develop a flow chart listing the various stages of the licensing process				
	General Objective 4.0: Know customer expectations in plumbing trade					
	4.1 Discuss customer and employer expectation on job site: - Time on task - Organisational skills - Team work - Personal appearance - Safe work habits - Proper written expression 4.2 Explain the importance of Organisational skills required to be successful in the trade: - Making material lists - Organising tools - Notebook - Creation of job sheets	- List the customer and employer expectation on job site - Explain the various importance of organization skill required to be successful in plumbing	- Man hour card	- Produce organised shop notebook in accordance with rule - Produce customers acceptable job sheets for on going projects which include man hours and material sheets for instructor grading	Guide student to demonstrate customer/ employee relationship on job site	Note book

PROGRAMME: **NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**

COURSE: TOOLS AND EQUIPMENT

COURSE CODE: CPP 105

CONTACT HOURS:

GOAL: This module is designed to acquaint the trainees with hand power tools and equipment used in plumbing profession

GENERAL OBJECTIVES: On completion of this module trainees should be able to:

1.0 Know hand tools used in the plumbing profession

2.0 Understand the functions of hand tools used in the plumbing profession

3.0 Know power tools and equipment used in plumbing profession

4.0 Understand the functions of power tools and equipment used in the plumbing profession

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: TOOLS AND EQUIPMENT			**Module:**		**Contact Hours:**	
Course Specification: Theoretical/Practical Contents						
WEEK	**General Objective 1.0: Know hand tools used in plumbing profession**					
1-4	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**
	1.1 List the hand tools used in the plumbing profession 1.2 Describe basic procedures for taking care of hand tools 1.3 Sketch some of the basic hand tools	– Explain the concept of hand tools – List the common hand tools used in the workshop – Explain the procedures for taking care of hand tools – Guide students on sketching some of the hand tools	Chalkboard Charts Textbooks	- Recognise common basic hand tools used in the construction trade - Follow procedure for taking care of hand tools	– Guide students to identify hand tools used in construction trade – Demonstrate procedures of taking care of hand tools	Hand tools material
	General Objective 2.0: Understand the classes and function of hand tools used in plumbing profession					
	2.1 Classify the basic hand tools used in plumbing profession, i.e: – Cutting tool – Measuring tool – Striking tool – Finishing tool, etc. 2.2 Explain the function of basic hand tools used in plumbing profession	- Discuss the basic hand tools used in plumbing profession - Discuss the classes of basic hand tools used in plumbing profession	Chalkboard Charts Textbooks	- Carry out practical task using the basic hand tool	- Guide students in the proper use of these tools	- Hand tools

	General Objective 3.0: Know power tools and equipment used in plumbing profession					
	3.1 List the common power tools and equipment used in plumbing profession 3.2 Describe the basic power tools and equipment commonly used in plumbing profession 3.3 Explain how to maintain power tools and equipment properly	- Explain the concept of power tools and equipment commonly used in plumbing profession - Explain the use	Chalkboard Charts Textbooks	3.4 Identify commonly used power tools and equipment used in plumbing profession 3.5 Demonstrate the maintenance procedure of power tools and equipment	- Guide students to identify power tools and equipment used in plumbing profession - Guide students on proper procedure for power tools and equipment	
	General Objective 4.0: Understand the functions of power tools and equipment used in the plumbing profession					
	4.1 Classify power tools and equipment used in plumbing profession 4.2 Explain the functions of power tools and equipment used in plumbing profession	- Discuss the classes of power tools and equipment used in plumbing profession - Discuss the functions of power tools and equipment used in plumbing profession		- Carry out practical task, use these power tools and equipment	Guide student in the proper use f these power tools and equipment	Power tools Equipments Materials

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING
COURSE: PLUMBING AND PIPE FITTING
MODULE: WATER SUPPLY I
CONTACT HOURS: 4HRS/WEEK
GOAL: This module is designed to enable the trainees understand the principles and techniques involved in the installation of cold and hot water supply to building from source and install and maintain the system.

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

1. Understand the sources and properties of water.
2. Identify sources of impurities and contamination of water and precaution to be taken.
3. Understand the general principles of the layout of domestic and public water supply system.
4. Understand the principles of constant and intermittent systems of public and domestic water supply and apply the principles in installing various pipes and public hot and cold water supply systems.
5. Understand the principles of domestic hot and cold water and install various systems of domestic cold and hot water.
6. Understand the principles of operation and uses of taps, valves, and cooks in public and domestic supply.
7. Identify and remedy faults and defects in water supply system.
8. Understand and carry out water supply system using wells and boreholes
9. Understand the safety precautions to be observed in the installation and use of domestic hot water supply.
10. Know how to plan and carry out public and domestic hot water installation maintenance of plumbing system.

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

1 Carry out simple treatment of water such as filtration, sedimentation and boiling.
2 Select and fix appropriate fittings i.e bends, tees, flanges, etc and valves i.e slice, air, gate, non-return valves, pumps and maintain them.
3 Carry out various methods of joining cast iron, asbestos, cement, steer and concrete pipes used for public water supply.
4 Install a direct or indirect domestic hot and cold water supply system.
5 Identify and remedy faults such as air-locks, worn out valves, leakages, etc in cold water supply system.
6 Cite and install appropriate hot water heaters.
7 Test the completed hot water installation for safety and efficient working of the system.

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course:			**Course Code :**		**Contact Hours:**	
Course Specification: Theoretical/Practical Contents						
Week	**General Objective: 1.0 Understand different types of pipe and fittings**					
	Specific Learning Outcome	**Teachers Activities**	**Resources**			
	1.1 Identify various types of pipes and their uses 1.2 Identify various types of fittings and other jointing materials 1.3 Explain uses of various fittings to students 1.4 Discuss other types of materials used for pipe work in domestic water supply e.g. WCs, Plugs, tanks, cistern, taps, etc. and their uses	- Explain the various types of pipes to students - Explain various classes of pipes to students - Explain various fittings and their uses e.g. elbow, bend, unions, adhesives, valves e.g. gate valves - Assist students to identify materials for manufacture of pipes and explain their importance	Chalk Photographs Charts	- Sketch and label valve, tap, cocks, etc. - Dismantle and assemble different valves, taps, etc.	- Show different types of pipes to students - Show different fittings and jointing materials to students - Guide students to join two or more pipes using different fittings - Guide students to dismantle and assemble valve and taps, etc.	Pipes Fittings Wrenches Valve Tap Spanners Wrenches and other relevant tools

	General Objective: 2.0 Know public water supply processes					
	2.0 Explain the general principles of public water supply 2.1 Explain the principle of constant and intermittent system of cold water supply 2.2 Read and interpret blue print public supply of cold water layout 2.3 Describe the types of support and protection required at various stages of the installation of trunk and service mains 2.4 Explain the importance of tank and reservoirs 2.5 Explain the importance of water meters	Discuss the general principles of water supply Discuss the processes of water supply Explain procedures of interpreting blue print Explain the support and protection required at various stages of installation Discuss the importance of water reservoirs Discuss the importance of water meters	Charts Textbooks Chalkboard Vehicles	- Students excursion to public water supply site - Plan and carry out the installation of tank and service mains - Select and find appropriate fittings - Select suitable materials for the constructio n of cistern for cold water supply	- Students excursion to public water supply site - Demonstrate the process of installing tank and servicing the mains - Guide students to select appropriate fittings - Guide students to select suitable materials in the construction of cistern for cold water supply	Transport Tanks Pipes Fittings Tools

	General Objective: 3.0 Know domestic water supply processes					
	3.1 Explain the principle behind water circulation 3.2 Explain the principles of direct and indirect domestic water supply 3.3 Explain the need for support and protection of pipes within building 3.4 Explain the need of valves in main water connection	- Discuss the principle behind water circulation - Discuss the principle of direct and indirect water supply - Give reasons why pipes are supported and protected in a building - Discuss the need for valves in main water supply	Textbooks Charts Chalkboard	- Select fittings and valves required for carrying out service connection to main - Carry out service connections to mains - Select appropriate pipes and fittings for cold and hot service pipes - Carry out pipe joining - Install a direct or indirect domestic cold water supply	- Show students the different kinds of fitting and where they are used - Guide students to select appropriate fitting for cold and hot service pipes - Demonstrate procedures for joining pipes - Guide students to install direct or indirect water supply	Fittings Pipes Tank Tools

	General Objective 4.0: Understand the Safety Precautions to be observed in the Installation and use of Domestic Hot Water Supply.					
	4.1 Explain the main provisions of the model and relevant local bye-laws on hot water installation. 4.2 State reasons for installing safety valves, control valves, air release valves and gauges etc. 4.3 State the danger associated with the storage and use of fuels, e.g. electricity, gas, oil, etc. 4.4 State reasons for installing thermostats and thermometer in the water heating system. 4.5 Describe the danger associated with boiler and cylinder explosions. EVALUATION: Assignment – (Sketches and Drawing). Student to draw clearly the cold water supply to and hot water extraction from an electric heater showing all the valves, fittings or pipe accessories, thermostat, thermometer etc	- State the disadvantages and advantages of using various fuels mentioned in 9.3 - Analyse, select and install thermostat and thermometer in water heating system. - Explain possible causes of boiler and cylinder explosion and prescribe precautions. - Prepare notes. - Assess the students.	Copies of various bye laws to be studied Specimen of various valves Samples of thermometer and thermostat.	- Demonstrate safe way of installing safety valves, control valves, etc. - Apply necessary safety precaution in the storage and usage of fuels	- Guide students to install these valves safely - Demonstrate safety precaution in the usage and storage of fuels	

	General Objective 5.0: Understand the processes of installing Domestic hot water supply					
14-15	5.1 Read and interpret blue print of public and domestic hot water system layout. 5.2 Explain the procedure for insulation of components of the hot water installation 5.3 Describe the different types of electric and gas water heaters 5.4 Explain the working principles of the different types of electric and gas water heaters. 5.5 State the ratings and efficiency of a common immersion and gas heaters and appropriate capacity for any given job EVALUATION: Class Test.	– Interpret the blue print and understand the use scale drawing – Explain the need and method of carrying out heat preservation (insulation) – Explain working principles of electric and gas water heater – Assist students to perform the installations – Terminal Examination.	Enough copies of blueprints to go round the students	- Position and support the components of the hot water installation e.g boiler, feed tank and hot water storage cylinder - Cite and install appropriate hot water heaters - Test the completed hot water installation for safety and efficient working of the system.	- Demonstrate positioning and support of hot water installation - Guide students to identify and install appropriate water heater - Demonstrate procedures for testing hot water installation - Supervise students to carry out the above procedures	Boiler, Cylinder, Feed tank, Gas water, Heater, Electric Water heater Solid fuel Insulation materials. Support devices Water heater

	General Objective: 6.0 Understand the installation of other plumbing appliances					
	6.1 Explain the working principles of dish washer and washing machines 6.2 Explain the procedures for installing washing machine and dish washer	- Discuss the working principles of washing machines and dish washer - Discuss the procedures for installing washing machine and dish washer	Textbooks Charts chalkboard	- Install a washing machine - Install a dish washer	Guide the students to demonstrate : - Installation of washing machine - Installation of dish washer	Washing machine Dish washer Tools used for installation
	General Objective: 7.0 Understand the various processes and operations of wells					
	7.1 List types of wells 7.2 Describe how wells are constructed 7.3 Discuss the selection of tanks, pumps and other materials needed for installation of cold water from wells and boreholes	- List types of wells - Discuss types of wells listed - List materials needed for well water connection - Compare well vs. intermittent water supply	Textbooks Charts	- Carry out a cold water installation using well as a source of water	- Explain the procedures involved in cold water installation using well as source of water - Guide students to demonstrate these procedures	Tanks Pipes Pumps Foot valves Fittings
	General Objective: 8.0 Know the process of maintaining plumbing systems					
	8.1 Explain the importance of maintenance 8.2 Identifying plumbing problems that relate to: - water supply e.g. tap, pipes, etc. - drainage system - hot water	- Discuss the importance of maintenance - Explain procedures for trouble shooting water supply process (hot and cold)	Textbook Chalkboard	- Dismantling and maintaining taps, valve, etc. - Dismantle and maintain the water closet	Guide students to: - Dismantle and maintain tap, valves, etc. - Dismantle and maintain water closet - Unblock drains and toilets	Taps Valves Toilets Drains

				- Repair leaking pipes - Unblock drain and toilets	-	

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING
COURSE: SANITATION AND DRAINAGE I COURSE CODE CPP 104
CONTACT HOURS: 3HRS/WEEK
GOAL: The module is designed to provide the trainee with the knowledge and skills to install, test and maintain sanitary and drainage systems in a building.

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

1. Understand the principles of sanitation in buildings, their classification and differentiate various types of sanitary appliances and properties of materials used in siting appliances in the building.
2. Install sanitary appliances and test the system for leakages, security, efficiency, etc.
3. Understand the functions of traps used in sanitary appliances and fix traps in sanitary system.
4. Know the methods and techniques of installing waste and soil pipes above ground level.
5. Understand the basic principles of good drainage, the layout of simple drainage system and the properties of materials used.
6. Understand the purpose of septic tank and soak-away pit and their construction for domestic and small scale industrial uses.
7. Understand the purpose of cesspool and their construction.
8. Understand the principles of environmental sanitation and its application to the installation and test of a surface drainage system.

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

1. Select and site sanitary appliances in different types of building.
2. Fix sanitary appliances and test them for leakages, security and efficiency.
3. Fix traps to the sanitary systems and test for efficiency.
4. Install and test soil and waste pipes above ground level.
5. Select and determine sizes of drain pipes
6. Carry out connections of drainage systems to septic tank and soak-away pits.
7. Carry out roof drainage and weathering
8. Join appropriate component and connect surface drainage to public sewer or soak-away.

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: SANITATION AND DRAINAGE I			**Course Code: CPP 104**		**Contact Hours**	
Course Specification: Theoretical/Practical Contents						
Week	**General Objective: 1.0 Understand the Principles of Sanitation in Buildings, their Classification and Differentiate Various Types of Sanitary Appliances and Properties of Materials used in Siting Appliances in the Building**					
	Specific Learning Outcome	**Teachers Activities**	**Resources**			
1-2	1.1 Explain the Principles of Sanitation in buildings 1.2 Classify and differentiate various types of sanitary fittings. e.g soil (W.C. Bidet, Slop Sink) Waste appliances (Wash Hand Basin, Bath, Sink) 1.3 Sketch, label and dimension, soil and waste appliances, etc. 1.4 Select the materials and describe the process used for the manufacture of soil and waste appliances 1.5 Design sanitary system 1.6 State the properties of the various materials used for the manufacture of waste and soil appliances 1.8 Know the sizes of the sanitary appliances and various fixing levels . EVALUATION: Site/Workshop Group Assessment.	- Identify various appliances and state their materials of manufacture. - Explain the process of manufacturing appliances - Sketch and dimension appliances - Explain installation principles of sanitary appliances - Prepare detailed notes for the students. - Assess the students.	- Chalkboard - Lesson plan - Manufacturer Brochures - Model of appliance on display - Tools – spirit level, cold chisel, rawl plugging, trowel, hammer, wrenches, plumbers' mait or tangit gum Sanitary appliances P.V.C. – soil and waste pipes Supply pipes.	1.9 Select and site sanitary appliances in different types of building 1.10 Select the various sizes of pipes suitable for supplies and wastes sanitary appliances to specification	- Ask students to separate waste appliances from soil appliances - Guide the students to select appropriate size of service and waste pipes to sanitary appliances	- Sanitary fittings - Relevant tools - Supply and waste pipes - Topgit gum - Yarn - Plumber mait

	General Objective: 2.0 Install Sanitary Appliances and Test the system for Leakages, Safety, Efficiency, etc.					
2-3	2.1 Read and interpret drawings of sanitary installation in a building plan 2.2 Explain the steps involved in fixing sanitary appliances according to specification 2.3 Explain the methods of testing leakages, e.g water, smoke, air e.t.c. EVALUATION: Practical Exercises – Group Work Assessment As per the Installation of Sanitary Appliances.	- Explain various methods of interpreting scaled drawings to the students - Assemble components and proceed to install sanitary appliances - Explain the testing and demonstrate the method of testing to detect leakages and ensure security and efficiency in the system. - Assess the students.	- Charts - Textbook - Chalk - Board	- Carry out necessary preparation relevant to the fixing of each sanitary appliances e.g. marking out, assembling the units raw plugging of walls and floor. - Fix sanitary appliance to given specification - Test finished sanitary installation for leakages, security, efficiency, etc.	- Guide the students to carry out the fixing of sanitary fittings to specification, observing safety precautions - Guide the students to carry out the testing procedure of the installed sanitary fitting for leakages and safety and efficiency	- Essential tools for installation as listed above - Drawing of life sanitary Compartment to be studied and site inspection carried out - Test Media – Air test, Drain plug, Smoke rocket, Air pump to be made available. - U Gauge

	General Objective 3.0: Understand the Functions of traps used in Sanitary Appliances and fix Traps in sanitary System					
	3.1 Differentiate the various types of traps and their uses – bottle trap, running trap, 'P' and 'S' trap, etc. 3.2 Sketch and describe different types of traps. 3.3 Explain the functions of the water seals in traps. 3.4 Enumerate the causes of unsealing of traps and their remedies. EVALUATION: Group Work Assessment.	- Sketch various traps and explain their differences. - Define water seal and explain its functions in traps. - Describe the positioning and fixing of traps.	- Charts - Textbook - Chalk Board	3.5 Fix traps to the sanitary systems and test for efficiency. 3.6 Test the efficiency of traps fixed 3.7 Determine the appropriate depth of seal	- Guide the students to carryout the fixing of the trap to specification while observing safety precautions.	Various traps e.g. Bottle trap, Running trap, 'S' trap, 'P' trap on display General Welding Tools
	General Objective 4.0: Know the Methods and Techniques of Installing Waste and Soil Pipes above Ground level					
6-8	4.1 Explain the Principles and arrangement of soil waste pipes above ground e.g. (one pipe, two pipe and single stack systems). 4.2 State the materials used for and the sizes of waste and soil pipes. EVALUATION: Group Work Assessment.	- Discuss pipes that are suitable for use in soil and waste installations. - Explain the principles that govern the arrangement of piping under one pipe, two pipes and single stack system. - List the materials for soil and waste installation and enumerate their correct sizes.	- Charts - Textbook - Chalk Board	4.3 Install and test soil and waste pipes above ground level.	- Guide the students to carryout the installation and testing of soil and waste pipes of drainage above ground level.	Sample of various soil and waste pipes Tools required for waste and soil pipe Suitable testing media for the installation to be assembled.

	General Objective 5.0: Understand the basic Principles of Good Drainage, the Layout of Simple Drainage System and the Properties of Materials Used.					
9-10	5.1 State the basic principles of good drainage system. 5.2 Explain the main provisions of the building regulation with regard to domestic drainage and apply them to drainage installation. 5.3 State the types of drainage systems i.e above ground and under ground types. 5.4 State the properties of and the materials used for drainage system, i.e. cast iron glazed stone-ware and P.V.C., etc. EVALUATION: Group Work Assessment	- Explain basic principle of a good drainage system. - Explain with the aid of drawing a simple drainage layout indicating drainage pipe joints, man hole, inspection chamber, e.t.c.	- Charts - Textbook - Chalk Board	5.5 Select and determine sizes of drain pipes. 5.6 Draw simple drainage layout and sketch drainage pipe joints, man holes, etc.	- Guide the students to construct a simple drainage layout to specification observing safety	- Suitable (materials) pipes and fittings for surface and underground drainage. - Tools required – As stated above suitable for drainage includes; diggers, Shovels, Cement, etc.

	General Objective 6.0: Understand the Purpose of Septic Tank and soak-away pit and their Construction for Domestic and Small Scale Industrial Uses.					
11-12	6.1 State the purpose of septic tank and soak-away drainage system. 6.2 Explain the principles of constructing septic tanks and soak-away drainage system. 6.3 Draw to scale a standard septic tank of domestic dwelling. 6.4 Choose various recommended sizes of septic tank and soak-away for building. 6.5 State the importance of ventilation in septic tanks. 6.6 Select the appropriate types of soak-away pit construction for various soils. 6.7 Explain the factors that govern the choice of type and size of soak away pits/septic tanks 6.8 Explain the principle of VIP toilet construction EVALUATION: Group Assessment and Individual Report on Septic Tank visited.	- Explain the principles of construction and the operation of septic tank and soak-away drainage system. - Draw to scale the simple layout of standard septic tank and soak-away drainage system for a domestic building. - Determine the different types of soak-away pit needed for various type of soil. - -	– Manual and Brochures	6.9 Determine the correct method of sizing septic tank and soak-away drainage system for various buildings. (practical) 6.10 Construct drainages and connect it to septic tank and soak-away drainage system.	- Guide the students to determine the correct size of septic tank and soak-away pit considering the population and type of soil for domestic and small scale industry. - Guide the students to construct a simple septic tank and soak away pit to specification.	– All relevant tools – All relevant materials – Pipes – Cement – Fittings - Visitation to mini-private septic-tank system

	General Objective 7.0: Understand the purpose of Cesspool and their Construction.					
13	7.1 State the purpose of a cesspool – drainage system. 7.2 State the requirements for the location of a cesspool. 7.3 Explain the principle of constructing a cesspool drainage system. 7.4 Draw to scale a standard cesspool drainage system for domestic dwellings. 7.5 Determine the correct method of sizing cesspool EVALUATION: Group Work Assessment.	– Enumerate the principle involved in construction of a cesspool drainage system – Draw to scale a standard cesspool system – Explain the proper requirement for the location of a cesspool. – Demonstrate the construction of a standard cesspool drainage system for domestic dwellings. – Prepare detailed notes for the students. – Assess the students.	- Charts - Textbook - Chalk – Board	7.6 Design a cesspool to specification 7.7 Connect drainage to cesspool according to specification.	- Guide the students in designing cesspool to specification. - Guide the students to construct cesspool to specification.	- All Relevant Tools as above. - All relevant materials like pipes, drainage fittings, e.t.c
	General Objective 8.0: Understand the Principles of environmental Sanitation and its Application to the Installation and Tests of a Surface Drainage System.					

14	8.1 State the importance of environmental sanitation. 8.2 List the materials used in surface drainage and state their properties 8.3 Make sketches showing half round, box, valley and ogee gutters.	– Fabricate common supports that can be used for pipe and gutter and guide students to do same. – Carryout installation of simple roof drainage – Effect discharges from the drainage in 8.5 above into public sewer or soak-away drainage system	- Charts - Textbook - Chalk Board	8.4 Select the materials used for surface drainage 8.5 Install simple roof drainage. 8.6 Construct support for pipes and gutters for collecting rain water 8.7 Join appropriate component and connect surface drainage to public sewer or soak-away. (Depending on the locality).	- Guide the students to Select the materials used for surface drainage - Guide the students in Constructing support for pipes and gutters for collecting rain water	- Aluminium P.V.C. - Galvanise iron Flat bar Screws and; - All relevant tools.

	General Objective: 2.0 Install Sanitary Appliances and Test the system for Leakages, Security, Efficiency, etc.					
2-3	2.1 Read and interpret drawings of sanitary installation in a building plan EVALUATION: Practical Exercises – Group Work Assessment As per the Installation of Sanitary Appliances.	- Read, drawings and explain and interpret scaled drawings for the students - Assemble components and proceed to install sanitary appliances - Install appliances using correct sizes of pipes and positioning at correct levels. - Explain the testing and demonstrate the method of testing to detect leakages and ensure security and efficiency in the system. - Prepare detailed notes for the students. - Assess the students.	Essential tools for installation as listed above Drawing of life sanitary Compartment to be studied and site inspection carried out Test Media – Air test, Drain plug, Smoke rocket, Air pump to be made available. U Gauge.	- Carry out necessary preparation relevant to the fixing of each sanitary appliances e.g. marking out, assembling the units raw plugging of walls and floor. - Fix sanitary appliance to given specification - Test finished sanitary installation for leakages, security, efficiency, etc.		

	General Objective 3.0: Understand the Functions of traps used in Sanitary Appliances and fix Traps in sanitary System					
	3.1 Differentiate the various types of traps and their uses – bottle trap, running trap, 'P' and 'S' trap, etc. Sketch and describe different types of traps. Explain the functions of the water seals in traps. Enumerate the causes of unsealing of traps and their remedies. EVALUATION: Group Work Assessment.	Sketch various traps and understand their differences. Define water seal and explain the functions of it in traps. Demonstrate the positioning and fixing of traps, and carry out their test to ensure efficiency. Prepare detailed notes for the students. Assess the students.	Various traps e.g. Bottle trap, Running trap, 'S' trap, 'P' trap on display General Welding Tools	Fix traps to the sanitary systems and test for efficiency.		
	General Objective 4.0: Know the Methods and Techniques of Installing Waste and Soil Pipes above Ground level					
6-8	Select the various types of soil and waste appliances. Explain the Principles and arrangement of soil waste pipes above ground e.g. (one pipe, two pipe and single stack systems). State the materials used for and the sizes of waste and soil pipes. EVALUATION: Group Work Assessment.	Identify pipes that are suitable for use in soil and waste installations. Explain the principles that govern the arrangement of piping under one pipe, two pipes and single stack system. List the materials for soil and waste installation and enumerate their correct (sizing) sizes. Prepare detailed notes for the students. Assess the students.	Sample of various soil and waste pipes Tools required for waste and soil pipe Suitable testing media for the installation to be assembled.	Install and test soil and waste pipes above ground level.		

	General Objective 5.0: Understand the basic Principles of Good Drainage, the Layout of Simple Drainage System and the Properties of Materials Used.					
9-10	State the basic principles of good drainage system. Explain the main provisions of the building regulation with regard to domestic drainage and apply them to drainage installation. State the types of drainage systems i.e above ground and under ground types. State the properties of and the materials used for drainage system, i.e. cast iron glazed stone-ware and P.V.C., etc. Select and determine sizes of drain pipes. Draw simple drainage layout and sketch drainage pipe joints, man holes, etc. EVALUATION: Group Work Assessment	Explain basic principle of a good drainage system. Put up a simple drainage layout, stating the correct sizes of pipes used. (practical) Put up simple sketches of drain pipe joints and suitable drainage interceptions. (practical) Prepare detailed notes for the students. Assess the students.	Suitable (materials) pipes and fittings for above and underground drainage. Tools required – As stated above suitable for drainage includes; diggers, Shovels, Cement, etc.			

	General Objective 6.0: Understand the Purpose of Septic Tank and soak-away pit and their Construction for Domestic and Small Scale Industrial Uses.					
11-12	6.1 State the purpose of septic tank and soak-away drainage system. 6.2 Explain the principles of constructing septic tanks and soak-away drainage system. 6.3 Draw to scale a standard septic tank of domestic dwelling. 6.4 Choose various recommended sizes of septic tank and soak-away for building. 6.5 State the importance of ventilation in septic tanks. 6.6 Select the appropriate types of soak-away pit construction for various soils. 6.7 Explain the factors that govern the choice of type and size of soak away pits/septic tanks 6.8 Explain the principle of VIP toilet construction EVALUATION: Group Assessment and Individual Report on Septic Tank visited.	- Explain the principles of construction and the operation of septic tank and soak-away drainage system. - Draw to scale the simple layout of standard septic tank and soak-away drainage system for a domestic building. - Determine the correct method of sizing septic tank and soak-away drainage system for various buildings. (practical) - Carry out drainage layout and connection to septic tank and soak-away drainage system. - Determine the different types of soak-away pit needed for various type of soil. - Prepare detailed notes for the students. - Assess the students.	– Manual and Brochures – All normal tools needed for drainage installation as above – Visitation to mini-private septic-tank system	- Carry out connections of drainage systems to septic tank and soak-away drainage system		

	General Objective 7.0: Carry out Connections of the Drainage System to Cesspool.					
13	7.8 State the purpose of a cesspool – drainage system. 7.9 State the requirements for the location of a cesspool. 7.10 Explain the principle of constructing a cesspool drainage system. 7.11 Draw to scale a standard cesspool drainage system for domestic dwellings. 7.12 Construct a standard cesspool drainage system for domestic dwellings. EVALUATION: Group Work Assessment.	– Enumerate the principle involved in construction of a cesspool drainage system – Draw to scale a standard cesspool system – Explain the proper requirement for the location of a cesspool. – Demonstrate the construction of a standard cesspool drainage system for domestic dwellings. – Prepare detailed notes for the students. – Assess the students.	– All Construction Tools as above.			
	General Objective 8.0: Understand the Principles of environmental Sanitation and its Application to the Installation and Tests of a Surface Drainage System.					
14	8.8 State the importance of environmental sanitation. 8.9 List the materials used in surface drainage and state their properties 8.10 Make sketches showing half round, box, valley and ogee gutters. 8.11 Manufacture support for pipes and gutters for collecting rain water 8.12 Carry out roof drainage and weathering.	– Fabricate common supports that can be used for pipe and gutter and guide students to do same. – Carryout installation of simple roof drainage – Effect discharges from the drainage in 8.5 above into public sewer or soak-away drainage system	Aluminium P.V.C. Galvanise iron Flat bar Screws and; All common tools as listed above.			

	Join appropriate component and connect surface drainage to public sewer or soak-away. (Depending on the locality). EVALUATION: Group Work Assessment and Terminal Examination	Explain and prepare notes accordingly. Assess the students.				

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING
COURSE: WATER SUPPLY II COURSE CODE: CNS 20
CONTACT: 7HRS/WEEK
GOAL: The module is designed to provide the trainee with the knowledge and skills to design, execute and maintain hot and cold water services and storage to buildings and carry out all required pipe fittings.

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

1. Plan and design various hot and cold water system for both domestic and industrial purposes in accordance with prevailing regulations and carry out installations and repairs.
2. Understand the method of selecting pumps for water supply purposes.
3. Understand the economic use of water and the installation of water meter for domestic and industrial purposes.
4. Demonstrate and understand the causes and prevention of water pollution.
5. Understand the uses and know the types of heating installations.
6. Understand the uses of steam calorifiers for heating water.
7. Understand the uses and types of space heaters and install it where necessary.
8. Understand the principles of solar heating system and carry out its installations.

PRACTICAL COMEPTENCE On completion of this course, the trainee should be able to:-

1. Carry out complete installation of a hot water supply system to specification.
2. Carry out elementary design of a scheme of water supply to multi-storey buildings and estimate of water consumption requirement for housing estate.
3. Carry out meter reading and costing.
4. Dis-infect polluted cold water installation system.
5. Select the appropriate valves used with calorifiers and their operational principles.
6. Carry out the installation of space heaters taking into consideration all necessary safety precautions associated with the installation and use of space heaters.

Select equipment, materials, fittings and design a simple scheme for air-conditioning installation.

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: WATER SUPPLY II		**Course Code :**		**Contact Hours:**		
Course Specification: Theoretical/Practical Contents						
Week	**General Objective: 1.0 Design plumbing systems**					
	Specific Learning Outcome	**Teachers Activities**	**Resources**			
1-2	1.1 Interpret and read blue prints 1.2 Determine average daily water consumption requirements for different buildings. 1.3 Calculate cold water pipe sizing using appropriate formulae and tables. 1.4 Plan and design installation scheme completely. 1.5 State water distribution processes. 1.6 Apply the principle of height to pressure in design 1.7 Recognize cross connections and back flows 1.8 Design cylinder tank system of hot water supply. 1.9 Explain the types of boilers 1.10 Provide the selection criteria of the types of boilers.	▪ Show the students how to read and interpret blue print ▪ Explain to students how to estimate average daily water consumption requirement for different buildings. ▪ Discuss the simple calculation of cold water pipe sizing using the appropriate formulae and tables. ▪ Explain how to prepare schedule of material required for design installation. ▪ Explain the process of distributing water. ▪ Discuss the principles of height to pressure in design.	▪ Chalkboard ▪ Textbooks ▪ Drawing Board and equipment ▪ Computer with appropriate CADD programme (software and hardware	1.11 Carry out installation to domestic, commercial and industrial buildings from a working drawing. 1.12	▪ Group and supervise students to carryout the activities in 1.11.	- Relevant tools - Materials - e.t.c.

		▪ Discuss the cross connection and back flow processes. ▪ Explain the design of cylinder tank systems of hot water supply. ▪ Discuss the type of boiler required for particular installation. ▪ Explain how to select the appropriate type of boiler for a particular installation.	▪			-
	General Objective 2.0: Understand the method of selecting pumps for water supply purposes					
3	2.1 Define pump 2.2 List various types of pump 2.3 Describe how pumps operate. 2.4 Carry out simple calculations on pumps sizing and discharge using appropriate formulae 2.5 Understand automatic controls for pumps 2.6 Sketch various the types of pumps.	▪ Explain the concept of pump ▪ Discuss the types of pumps ▪ Explain the working principles of pumps. ▪ Solve simple problems on pump sizing and discharge using appropriate formulae. ▪ Explain the need for and provision of automatic control for pumps.	- Textbooks - Calculator - Chalkboard	2.7 Dismantle and assemble various types of pump 2.8 Check seals for leakages.	- Supervise students activities	▪ Sample pumps ▪ relevant tools

	General Objective 3.0: Understand the economic use of water and the installation of water meter for domestic and industrial Purposes.					
4	**3.1** Identify the causes of water wastage **3.2** Explain the appropriate remedies of water wastages. **3.3** Explain water meters and their purposes. **3.4** Discuss various types of water meters. **3.5** List the procedure for the installation of water meters.	▪ Explain the causes of water leakages such as; a. Leakage b. Defective fitting c. Personal negligence d. Rust e. burst pipe ▪ Discuss with students the appropriate measures to remedy causes of wastages. ▪ Discuss various types of meters. ▪ Explain the procedures for the installation of water meters.	▪ Charts and brochures. ▪	**3.6** Inspect an installation for wastages and rectified as appropriate **3.7** Select appropriate type of water meters for a scheme and carry out its installation **3.8** Carry out meter reading and costing.	- Guide the students in carrying out the activities.	-Sample of water meter - Installation tools
	General Objective 4.0: Understand the Causes And Prevention of Water Pollution					
5	4.1 Explain water pollution. 4.2 State sources of water pollution -	▪ Discuss the concept of water pollution. ▪ Identify sources of water pollution e.g.: - Burst Defective valves	▪ Chalkboard and charts	4.3 Identify sources of pollution and carryout remedial measures.	▪ Guide the students to carryout the activities in 4.3	▪ Necessary tools required

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	General Objective 5.0: Understand the functions of various types of Heating Installation					
6	5.1 Define the various terms used in heating system e.g latent heat, circulating head, index radiator, friction head, etc. 5.2 State the importance of hot water heating system. 5.3 Explain the various types of heating system 5.4 Design various types of heating systems, e.g single pipe up feed, etc 5.5 State the correct procedures of positioning of pumps in a heating installation	▪ Explain the water heating term such as latent heat, circulating head, index radiator, friction head e.t.c. ▪ Discuss the importance of hot water heating system. ▪ Explain the types of heating systems such as single pipe, up feed, e.t.c. ▪ Discuss the procedures for designing single and two pipe systems of heating.	▪ Charts ▪ Textbooks ▪ Chalk Board ▪ Chalk	5.6 Install domestic and industrial heating systems. 5.7 Maintain domestic and industrial heating systems. -visit to industry using boilers.	- Supervise the students in installation and maintenance of both domestic and industrial heating systems.	- Sample of suitable pump for a heating installation system - Relevant tools
	General Objective 6.0: Understand the functions Of steam calorifiers for heating water					

7-9	6.1 Define calorifiers for heating water. 6.2 State the uses of calorifiers for heating water 6.3 Explain the principles of operation of steam calorifiers 6.4 Sketch and label various types of calorifiers 6.5 Explain how the source of energy / space determine the location/ positioning of calorifiers 6.6 Discuss valves used with calorifiers.	▪ Explain calorifier used for heating water. ▪ Discuss the various uses of calorifiers. ▪ Discuss the principles of operation of steam calorifiers. ▪ Show with aid of diagram various types of calorifiers. ▪ Discuss factors affecting location and positioning of calorifiers. ▪ Explain the appropriate valves used with calorifiers and their operational principles e.g;	▪ Charts and brochures ▪ Sketching book ▪ Pencil	**6.7** Select and use appropriate valves with calorifiers	▪ Guide the students to carryout the activities in 6.7.	▪ Sample of calorifier with valves on display
		- Pressure reducing valve - Steam trap - Thermostat valve - Altitude valve				

	General Objective 7.0: Understand the types and uses of Space Heaters					
9-10	**7.1** Explain the principles of operation space heaters **7.2** List the different types of space heaters and state their advantages **7.3** Explain the procedures for installation of space heaters.	▪ Discuss the principles of operation of space heaters. ▪ Discuss the procedures for installation of space heaters.	▪ Chart and brochures ▪ Safety Posters	**7.4** Demostrate the installation of space heaters. **7.5** Carryout simple maintenance of space heaters.	- Guide the students to carry out installation and maintenance of space heater.	- Space heater - relevant tools
	General Objective 8.0: Understand solar heating system and its installation.					
11-12	8.1 Explain the concept of solar energy. 8.2 Discuss the devices used for collecting and storing of solar energy. 8.3 Explain the procedures for installing these devices. 8.4 Discuss working principles of these devices.	▪ Discuss the concept of solar energy. ▪ List and explain the devices used for collecting and storing of solar energy. E.g; - Solar Panel - Solar Collectors - e.t.c ▪ Explain the working principles of solar devices.	▪ Charts ▪	**8.5** Demonstrate the installation of a model water heater.	- Guide the students to carry out installation and maintenance of solar heating system.	- Materials - relevant tools -Solar heating conductors

	General Objective 3.0: Understand the economic use of water and the installation of water meter for domestic and industrial purposes.					
4	**3.9** Identify the causes of water wastage f. Leakage g. Defective fitting h. Personal negligence i. Rust j. burst pipe **3.10** Effect the appropriate remedies **3.11** Explain the purpose of installing water meters EVALUATION: Group discussion with Teacher's interaction	▪ Ask students to explain appropriate measures to remedy each cause. ▪ Ask students to explains the purpose of water meters and list the different types. ▪ Ask students to explain suitable sitting positions of water meters and to learn how to read and cost water meters.	▪ Charts and brochures. ▪ Sample of water meter ▪ Installation tools ▪ Testing Bay	▪ Select appropriate type of water meters for a scheme and carry out its installation ▪ Carry out meter reading and costing.	▪ Demonstrate and explain all the activities.	
	General Objective 4.0: Demonstrate And Understand The Causes And Prevention Of Water Pollution					

5	4.1 State the effects and remedy of such pollution Dis-infect polluted cold water installation system. 4.2 Explain sources of water pollution e.g.: - Burst - Defective valves	▪ Explain to the students and provide notes.	▪ Chalkboard and charts	Identify sources of pollution e.g: - Burst pipe - Defective valves	▪ Ask students to carry out the dis-infection of a polluted cold water installation. (laboratory practical)	▪ Disinfecting chemicals ▪ Water ▪ Pollutant ▪ Nose Mask ▪ Hand gloves ▪ Test Lab

	General Objective 5.0: Understand The Uses And Know The Types Of Heating Installations

6	5.8 State the importance of hot water heating system. 5.9 Define the various terms used in heating system e.g latent heat, circulating head, index radiator, friction head, etc. 5.10 State the basic information needed when designing a hot water heating installation 5.11 Design various types of heating systems, e.g single pipe up feed, etc 5.12 Explain the difference between, the advantages and disadvantages of single and two pipe systems of heating 5.13 State the use and the correct positioning of pumps in a heating installation EVALUATION: Group discussion with teachers interaction Marking of individual design.	▪ Ask students to explain the basic requirements needed when designing hot water heating installation ▪ Ask students to design various types of heating systems ▪ Ask students to explain the advantages and disadvantages of single and two pipe systems of heating ▪ Explain and prepare notes. ▪ Group discussion with teacher interaction ▪ Visit to industry using boilers	▪ Drawing equipment ▪ Sample of suitable pump for a heating installation system			
	General Objective 6.0: Understand The Uses Of Steam Calorifiers For Heating Water					
7-9	6.7 State the uses of calorifiers for heating water 6.8 Know the position of use and source of energy for successful operation of calorifiers 6.9 Explain the principles of operation of steam calorifiers	▪ Ask students to determine the position for correct sitting of calorifier and explain the source of energy for its successful operation	▪ Sample of calorifier with valves on display ▪ Charts and brochures			

	6.10 Sketch and label various types of calorifiers	▪ Ask students to sketch various types of calorifier and explain the principles of operation of each. ▪ Ask students to determine appropriate valves used with the calorifier and explain their operational principles e.g i. Pressure reducing valve ii. Steam trap iii. Thermostat valve iv. Attitude gauge ▪ Explain and prepare notes.	▪ Sketching book ▪ Pencite	- Select the appropriate valves used with calorifiers and their operational principles e.g a. Pressure reducing valve b. Steam trap c. Thermometer d. Altitude gauge, etc e. Thermostat		
	General Objective 7.0: Understand The Uses And Types Of Space Heaters And Install Space Heaters Where Necessary					
9-10	**7.6** Explain the principles of space heaters **7.7** State the different types of and advantages of space heaters **7.8**	▪ Ask students to explain the principles of operation of space heaters and explain the difference between its use and convectional heating installation ▪ Ask students to state different types of space heaters and state the advantages and disadvantages of each. ▪ Explain and prepare notes. ▪ EVALUATION: Group discussion, Assessment as per assignment given.	▪ Sample of space heater on display ▪ Chart and brochures ▪ Installation tools ▪ Safety Posters	▪ Carry out the installation of space heaters taking into consideration all necessary safety precautions associated with the installation and use of space heaters.	▪ Ask students to carry out installation of space heater	

	General Objective 8.0: Understand the Principles of solar heating systems and carry out installation of solar heating system

11-12	8.5 Explain the source of solar heating energy 8.6 State the importance and usage of specific material for solar heating installation 8.3 Explain the principles of solar heating energy and carry out a model installation of solar heating system	▪ Ask students to enumerate the need for and the use of solar heating. ▪ Ask students to install a model solar heating system and explain principles of operations (practical) ▪ Explain and prepare notes. ▪ EVALUATION: Group Assessment	▪ Charts ▪ Solar heating conductors and tools			

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING
COURSE: SANITATION AND DRAINAGE II COURSE CODE: CPP 203
CONTACT HOURS:
GOAL: The module is designed to provide the trainee with the knowledge and ability to design and execute both public, commercial, domestic and drainage and sanitary systems.

GENERAL OBJECTIVES: On completion of this course, the trainee should be able to:

1. Understand the arrangement and fixing of sanitary appliances in public building and factories.
2. Know the general layout and design of drainage system for town and country houses.
3. Carry out drainage layout using appropriate instruments.

PRACTICAL COMPETENCE: On completion of this course, the trainee should be able to:-

1. Install any type of sanitary appliance in public buildings and industries.
2. Determine the rate of discharge from drainage channels using appropriate instruments.
3. Carry out simple setting out of drainage layout using appropriate
4. Install timbering to sides of drainage trenches.

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: SANITATION AND DRAINAGE II			**Module: CPP 203**		**Contact Hours:**	
Course Specification: Theoretical/Practical Contents						
WEEK	**General Objective 1.0: Understand the arrangement and fixing of sanitary appliances in public building and factories**					
1-4	**Specific Learning Outcome**	**Teachers Activities**	**Resources**			
	1.1 Explain the various arrangement and fixings of sanitary appliances to hotels, schools, public building and factories using separate and combined systems (one pipe, two pipes and single stack systems). 1.2 Design one-pipe, two-pipes and single stack systems for dwellings and flats including multi-storey buildings. 1.3 Explain the use and the importance of polyvinyl, chloride (P.V.C.) for soil and waste pipe in present day installation.	• Discuss with the aid of layout sketches of mentioned appliances in various mentioned buildings • Discuss the procedures of designing one pipe, two pipe and single pipe system for dwellings and flats including multi-storey buildings. • Explain the need for proper ventilation of sanitary apartment and enumerate different methods that can be adopted explain the use of plastic materials in present day plumbing and emphasise the importance of P.V.C. for soil and waste pipe installation.	Sample of Specific types of Appliances on display	1.4 Select various types of appliances to be used in different types of buildings. 1.5 Carry out proper ventilation of sanitary apartment e.g natural, measurement . **1.6** Install any type of sanitary appliance in public buildings or industries.	• Supervise the students to identify specific sanitary appliances suitable in Hotels, Schools, Public Buildings and Factories • Guide the students to carryout installation of one pipe, two pipe and single stack system for dwelling and flats including multi-storey system. • Guide the students to carryout a sanitary installation in public building or industries.	Installation materials and tools Industrial attachment

	General Objective 2.0: Know the general layout and design of drainage system for town & country houses

7-8	2.1 Describe the different systems of drainage installations 2.2 State the requirements and the regulations governing the design of drainage schemes for town and country houses. 2.3 Plan and design simple drainage and sewage layout scheme for town and country houses. 2.4 Calculate the rate of discharge from drainage channels using appropriate instruments/formulae/charts 2.5 Describe sewage pumps and their uses	• Discuss the different types of systems of drainage installation. • Explain how to determine Specific requirements and regulations governing the design of drainage schemes for town and country houses. • Explain the procedures in the designing of drainage layout schemes for town and country houses. • Solve problems on the rate of discharges through drainage pipes and channels using appropriate instruments/formulae/chart	• Drawing Instruments Calculator, site visit • Relevant design Regulations and byelaws	2.6 Demonstrate the use of various setting out instruments, e.g. dumpy level, sight level, sight rail, boning rods, etc 2.7 Carry out simple setting out of drainage layout using appropriate instrument. 2.8 Install timbering to sides of drainage trenches and state reason for the choice of the timbering used 2.9 Test drains and soil pipes by means of smoke, water, chemical and air pressure.	• Guide the students to identify various setting out instruments e.g. Dumpy level, Sight level, sight vail, and boning Rod, etc. and explain the uses of each. • Follow the procedure to carryout a simple drainage layout using the above listed instruments • Guide the students to carryout testing of soil pipes and drains by means of smoke,	Gas equipment Blow pipe, Necessary metal support, various sizes of metals Chart, Apron and Gloves.

PROGRAMME: **NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**
COURSE: **WATER TREATMENT** **COURSE CODE:**

CONTACT HOURS:

GOAL: The module is designed to provide the trainee with the knowledge and techniques of water treatment.

GENERAL OBJECTIVES: On completion of this course, the trainee should be able to:

1.0 Understand the sources and properties of water

2.0 Identify sources of impurities of water and precautions to be taken

3.0 Have general understanding of water contaminants and water problems

4.0 Understand devices used to disinfect water

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: WATER TREATMENT		**Course Code :**		**Contact Hours:**		
Course Specification: Theoretical/Practical Contents						
Week	**General Objective: 1.0 Understand the Sources and Properties of Water.**					
	Specific Learning Outcome	**Teachers Activities**	**Resources**			
1	1.1 Explain the source of water in nature. 1.2 State the properties of water from wells, rivers, lakes and rain.	1.3 Enumerate the sources of water such as rainfall, rivers, lakes, wells, etc. – Explain the properties of water from wells, rivers, lakes and rain.	– Textbooks – Charts – Chalkboard	– Visitation to nearby rivers, wells etc		
2	**General Objective 2.0: Identify Sources of impurities of water and precautions to be taken**					
	2.1 State the sources of impurities in water. 2.2 State the precautions to be taken to prevent contamination of water supplies. 2.3 Define hardness 2.4 Explain types of hardness and softness of water, e.g. 2.5 Identify common water problem 2.6 State the constituents of water contaminants. EVALUATION: Class Assessment	– Discuss the various sources of impurities in water from wells, rivers and rain. Discuss the precautions to be taken to prevent contamination of water supplies. – Discuss hardness and its formation. – Enumerate the types of hardness i.e. temporary and permanent hardness. – Explain the common water problems. – Explain the constituent of water contaminants.	– Textbooks – Charts – Chalkboard	– Carry out simple treatment of water such as filtration, sedimentation, boiling.	– Demonstrate simple experiment (filtration and sedimentation and boiling)	Samples of water purification media Vehicles

WEEK	**General Objective 3.0: Understand methods and devices used to disinfect contaminants**					
	Specific Learning Outcome	**Teachers Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**
	4.1 Identify methods used to disinfect water 4.2 Explain the operation of devices used to disinfect the water. 4.3 Mention the chemicals used in disinfecting water. 4.5 Know the devices used in disinfecting water.	- Guide students to identify and list devices used to disinfect contaminant in water - Explain each of the identified chemicals - Discuss function of these devices - Identify which devices is applied to disinfect a particular contaminant - Visit to a pure water factory	– Textbooks – Charts – Chalkboard	4.6 Demonstrate/ flush out visible water contaminant from plumbing system 4.7 Disinfect a portable water system	Guide students to carry out simple experiment on: - Ways of flushing out contaminant from plumbing system - Procedure for disinfecting portable water system	Relevant Tools

PROGRAMME: **NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**
COURSE: **WELDING PROCESSES** **COURSE CODE:**
CONTACT HOURS: 3RS/WEEK
GOAL: The module is designed to provide the trainee with the knowledge and techniques of gas and bronze welding to enable him carry out all gas and bronze welding operations in normal plumbing work.

GENERAL OBJECTIVES: On completion of this module, trainee should be able to:-

1.0 Understand and apply the general safety precautions related to gas and bronze welding.
2.0 Know and apply successfully various gas welding processes/operations including the acetylene and oxy-fuel gas cutting processes.
3.0 Understand the process of manufacture and storage of oxygen and acetylene and associated safety measures.
4.0 Assemble oxygen and acetylene equipment ready for welding operations.
5.0 Understand the general principle of brazing and bronze welding and use them in joining metals to a high degree of efficiency.
6.0 Know and weld together the different types of non-ferrous and ferrous metals.
7.0 Understand and apply the fuel gas cutting metals to given specification.
8.0 Know the various welding defects and rectify them.

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

Select, use and care for protective wears for carrying out gas welding operations.
Weld metals together in down-hand or flat position/leftward and rightward techniques.
Carry out bronze welding on prepared joints using slightly oxidizing flame as appropriate and observing necessary safety precautions.
Weld stainless steel components using appropriate welding rods, techniques and observing safety precautions.
Detect welded joints defects and rectify them.

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: WELDING PROCESSES			**Course Code: CBW 11**		**Contact Hours 3hrs//week**	
Course Specification: Theoretical/Practical Contents						
	General Objective: 1.0 Understand and apply the general safety precautions related to Gas and Bronze Welding					
	Specific Learning Outcome	**Teachers Activities**	**Resources**			
1-2 3	1.1 Describe the meaning of safety as it relates to gas and bronze welding 1.2 Explain the process of transporting and storing full and empty gas cylinder using appropriate equipment 1.3 Apply appropriate safety precaution while carrying out the following: - Gas welding operations on containers which have been emptied of chemicals, inflammable or explosive liquids - Gas welding near containers with inflammable materials, e.g petrol tanks - Gas welding in confined areas 1.4 Select, use and care for protective wears when carrying out gas welding operations, e.g. – Welding goggles – Welding shields – Gloves – Boots, etc. – Nose covers, etc.	– Explain the concept of safety as it relates to gas and bronze welding – Discuss the process of transporting full and empty gas cylinder using appropriate equipment – Explain the appropriate safety precautions while carrying out the operations listed under 1.2 – Explain the importance of fans and cathode extractors when welding in a confined area – Emphasise the importance and use of protective wears during gas welding operations – Show and explain to the student various safety posters and appropriate positions to display them	Chalkboard Charts Textbooks Poster	- Demonstrate safety precautions in transporting and storing full and empty gas cylinders using appropriate equipment - Demonstrate the application of appropriate safety precautions while carrying out gas welding operations listed in 1.2 -	- Guides students - Supervises student - Guides students	Gas welding equipment Protective wears Trolleys

	1.5 Display safety signs – prohibition, mandatory, warning and information signs	– Emphasise the importance and use of protective wears, e.g. welding goggles, gloves, booths, nose covers, etc. – Assess the students.		- Perform the usage of the appropriate protective wears when carrying out gas welding operation		
	General Objective 2.0: Know and apply successfully various gas welding processes/operations including the acetylene and oxy-fuel gas cutting processes.					
4-6	2.1 Identify the following gas welding equipment, describing their features, functions, applications and care: – generators – regulators – blow pipes – nozzles – hoses – gas cylinders and their colours – economizers – check valves 2.2 Differentiate between the following types of generators, stating their merits and demerits. – Carbide to water generator – Calcium carbide to-water generator 2.3 Identify the main parts of the generator e.g.	– Identify the welding component and explain the differences – Explain the difference between the two low pressure gas generating equipment. State the advantages and the disadvantages of the two low pressure generating equipment – Analyse the properties of calcium carbide and process of generating acetylene from carbide – Prepare detailed notes. – Assess the students.	Gas generator Gas regulator Blow pipes, Nozzles Pressure hoses Gas cylinders Economizers Check valves Carbide trays Calcium carbide Pressure valve Purifiers	- Carry out operations involving the use of different types of gas welding equipment	- Guide students in performing operations involving the use of different types of gas welding equipment	Gas welding equipment

	– hydraulic back pressure valve – purifiers – carbide trays, etc. 2.4 Distinguish between high and low pressure systems of welding. 2.5 State the properties of calcium carbide	–				
7	2.6 Generate acetylene using calcium carbide guiding against danger or over-charge 2.7 Identify types of welding rods stating their properties, compositions, and uses Differentiate between welding and cutting torches 2.8 Identify the following flames and describe how they are derived in the oxy-acetylene welding process: – oxidizing flame – carbonising flame – neutral flame 2.9 State the instances of the application/uses of the type of flames named in (2.8) above 2.10 Light the welding torch and adjust the flame to each of the types named in 2.8 above	– Explain the procedures for generating acetylene using carbide – Identify different welding rods and enumerate their properties composition and uses. – Explain the difference between welding and cutting torches – Discuss simple processes of gas welding with or without filler – Explain the mixture that produces the three types of flame listed in 2.8 – Identify convectional welding symbols and preparation of plate surfaces for carrying out various joint e.g butt and fillet joints.	Calcium carbide Carbide trays Posters and brochures Listing and identifying part of welding equipment Set of welding wedge Cutting tools Materials Welding rods, spark lighter Posters indicating different welding joints.	- Generate acetylene using carbide - Light welding torch and adjust to the three types of flames - Run beads with and without filler rods	- Demonstrate these processes and supervise students repeating the processes.	

	2.11 Prepare plate surfaces and run beads: – without filler rods – with filler rods	– Demonstrate different welding methods, and emphasise the functions of backing bars and strips. – Prepare detailed notes. – Assess the students.				
	2.12 Make neat labelled sketches indicating the conventional symbols for the welded joints, e.g. butt joint, fillet joint and lap joint. 2.13 Prepare plate surfaces for the following welding joints and tack weld: i. Butt joints ii. Fillet joint iii. Lap joint 2.14 State the functions of backing bars and strips	–		– Perform preparation of plate surfaces for welding joint listed in 2.13 – Weld metals together in down-ward or flat position – Apply backing bars and strips according to instructions	- Demonstrate these operations - Guide students perform same operations	
	General Objective 3.0: Understand the Process of Manufacture and Storage of Oxygen and Acetylene and Associated Safety Measures.					
8	3.1 Explain the various methods of manufacture and storage of oxygen and acetylene 3.2 Identify the difference between the equipment for oxygen and acetylene	– Enumerate the principal components of manufacture of oxygen and acetylene gas (carbide) – Identify the difference between oxygen and acetylene equipment; and	Charts Textbooks Chalkboard	- Identify the difference between the equipment for oxygen and acetylene	- Guide and supervise students perform this function	Carbide Generators Cylinders

	3.3 State the safety precautions: – during handling – during storage – during assembly and use. EVALUATION: Oral quize with Intermittent Questions	emphasise all safety precaution during handling, storage, assembly and use of oxygen and acetylene. – Visitation trip to Industrial Gas manufacturing companies – Assess the students.		- Manufacture through various methods, oxygen and acetylene		
	General Objective 4.0: Assemble oxygen and Acetylene Equipment ready for Welding Operation.					
9	4.1 Position and secure the acetylene welding cylinders 4.2 Clean the outlet of cylinder of foreign body and fix on the pressure regulators 4.3 Identify the correct hose pipes and fixing them on to pressure regulators 4.4 Fix on the welding blow pipe to the hose pipe and attaching correct nozzle 4.5 Test the completely assembled equipment for leakages using soapy water 4.6 State the functions of the various components, viz • regulators • blow-pipe • nozzles • hoses, etc.	– Discuss the positioning and securing acetylene cylinders – Explain colours used to identify hose pipes – Discuss the procedures for fixing blow pipes to hose pipes and test for leakages – Explain the functions of components listed in 4.6	Charts Textbooks Chalkboard	- Position and secure the acetylene cylinders - Clean the outlet of cylinder and fix on pressure regulators - Assemble oxy-acetylene welding equipment - Conduct leakage test on assembled equipment - Fix blow-pipe to hose pipe	- Demonstrate the procedure and operations in 4.1 – 4.7 - Supervise students repeat same operation	Silver solder Brazing welding rods Bend bolt Tapping hammer Brazing spectacle Flux Bronze materials Filler rods Gas – oxy-acetylene Safety posters

				- Carry out oxy-acetylene welding on any materials applying left ward and rightward techniques		
	General Objective 5.0: Understand the General Principle of Brazing and Bronze welding and use these Methods in Joining Metals to a high degree of Efficiency					
10	5.1 Know the relationship and differences between brazing/silver soldering and bronze welding 5.2 Light a flame necessary for successful brazing and bronze welding 5.3 State the composition of the various types of fluxes and filler rods used for brazing and bronze welding	– Explain difference between silver soldering and bronze welding and demonstrates how to obtain suitable flames for brazing and bronze welding – Explain the purpose of flux and enumerate the different various types of fluxes and filler rods used for brazing and bronze welding –	Textbooks Charts Posters Chalkboard	– Prepare metal/edges for brazing – Braze joints using oxy-acetylene flame/brazing lamp, observing necessary safety precautions – Prepare joints for bronze welding e.g. bell mouth, branch joints, joint etc.	– Demonstrate the method of preparing metal for brazing and carryout brazing joint using oxy-acetylene flame or brazing lamp – Observe necessary precautions – Guide and supervise students	Oxy-acetylene equipment Brazing lamp Brazing rod, fluxes, (paste and powder type). Pipe expander Abrasive papers, taping hammer, bend bolt, etc. Copper plates or rod Cast iron plates Galvanised sheet Steel plates/rod Safety materials

	5.4 Explain the importance of using bronze welding for the welding of dissimilar metals; e.g. a. copper and steel b. cast iron and opper c. galvanized materials EVALUATION: Students Assessment, through identification of already stated equipment and materials.	– Explain the importance of bronze welding for successful – welding of dissmilar metals; e.g. copper and steel, cast iron and copper, and galvanize materials. – Prepares notes for the students. – Assess the students.		– Carry out bronze welding on prepared joints using slightly oxidizing flame as appropriate and observing necessary safety precautions. – Prepare the following bronze welding joint – bell mouth, branch joint, etc – Set slightly oxidising flame and proceed to carry out bronze	–	

		–		– Weld on prepared welding joint, observing necessary safety precautions. – Carry out bronze welding on prepared joints		
	General Objective 6.0: Know and weld together the different types of Non-ferrous and ferrous Metals					
11 12	6.1 Identify the following non-ferrous metals: – Copper – Aluminium – Brass – Bronze, etc 6.2 Describe the composition and state the mechanical properties of the above named non-ferrous metals. Mechanical properties to include: • Ductility • Malleability • Hardness; etc. 6.3 State the properties and composition of fluxes used for welding non-ferrous metals	– Explain the different between ferrous and non-ferrous metals – Identify and state the compositions/mechanical properties of – Brass, Bronze, and stainless steel – Emphasise the properties of stainless steel and show the technique and material for a successful welding		– Prepare and weld non-ferrous metals using appropriate fluxes	– Prepare non-ferrous materials for welding – emphasising suitable fluxes, composition and properties. Demonstrate the process of preparation and welding of bronze components	Oxy-acetylene equipment Brazing lamp Brazing rod, fluxes, (paste and powder type) Pipe expander Abrasive papers Taping hammer, bend bolt, etc. Bronze plate Bronze plates Stainless Steel Materials Coppers Materials Aluminium Materials

	6.4 Prepare bronze components for welding, avoiding sharp edges and weld to specification. 6.5 Identify and state the type, composition and properties of stainless steels used in metal work. 6.6 Explain the effect of welding together two different metals.	– Explain the effect of welding – two dissimilar metals together i.e. Electrolytic corrosion. – Prepare detailed notes for the students. – Assess the students.	Textbook Charts Chalkboard	– Prepare stainless steel components for welding – Weld stainless steel components using appropriate welding rods, techniques and observing safety precautions.	- Supervise students perform these operations -	Various types of Welding rods Safety Posters Safety materials
	General Objective 7.0: Fuel Gas Cutting Process					
13	7.1 State the principles and applications of fuel-gas cutting process e.g. Manual Machine 7.2 Describe various fuel gases used in oxy-fuel cutting: • acetylene • propane • butane • coal gas, etc.	– Explain oxidation principles behind fuel-gas cutting and state the different methods of cutting – Enumerate different fuel gases used in oxy-fuel cutting and explain their advantages and disadvantages. – Identify manual and machine cutting equipment.	Colour code for different fuel-Gases	- Perform cutting operation using various gases -	- Demonstrate fuel gas cutting operations using various fuel gases - Guide students while performing these operations	Oxy-fuel cutting equipment

	7.3 State the advantages and disadvantages of using the above mentioned, fuel-gases for oxy-fuel cutting operations, EVALUATION: Assessment of Simple Practical Project	Prepare detailed notes. Assess the students.				
	General Objective 8.0: Know the various Welding Defects and Rectify Them.					
14	8.1 Determine welded joints defects by the known methods e.g. – non-destructive test – destructive test 8.2 Rectify welded joint defects enumerated above 8.3 State the main causes of defects in welded joints. EVALUATION: Visual examination of the Cutting Parts.	– Explain and demonstrate method of non destructive and destructive testing of welded joints – Discuss how to rectify the enumerated defect – State and explain the causes of defect in welded joints. – Prepare detailed notes for the students. – Assess the students.	Textbooks Charts Chalkboard	- Carry out destructive and non destructive test on joints - Rectify weld defects on joints **PRACTICAL EXERCISES** - Production and storage of oxygen and Acetylene gas using Calcium carbide and electrolysis of water.	- Demonstrate the two methods test on weld - Guide students to rectify weld defects -	Hacksaw File Table Vice Gammer ray Or ex-ray machine Etching fluid Hammer

		–		- Position, assemble and test gas welding equipment ready for welding operation - Preparation of plate surfaces for the following welding joint and Tack and weld: a. Butt joint b. fillet joint c. Lap joint d. Prepare joints for bronze welding e.g bell mouth branch joint, V joint.		

	General Objective 9.0: Understand the principles and functions of electric arc welding transformer and carry out electric arc welding operations with facility					
8-9	9.1 Differentiate between electric arc welding machine and gas welding equipment. 9.2 Identify parts of the transformer and their functions 9.3 Relate arc welding to gas welding process 9.4 Select the current rating suitable for the thickness of metals. 9.5 Sketch and label transformer	Explain the difference between electric arc welding and gas welding. Enumerate the equipment needed for each class of welding and explain their differences. discuss parts of electric welding transformer and explain their functions. Set or obtain current rating suitable for thickness of metals.	Textbooks Posters Chalkboard	- Apply necessary safety precautions while using the equipment to carry out electric arc welding.	- Guide students to carry out electric arc welding -	Complete Arc striking equipment Electrodes (different gauges) Rubber boot Gloves Protecting clothing Welding shield

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING
COURSE: GAS AND STEAM WORK CODE: CPP 204
CONTACT HOURS:
GOAL: The course is designed to provide the trainee with the knowledge and ability to plan, fabricate and install gas, and steam pipe work.

GENERAL OBJECTIVES: On completion of this course, the trainee should be able to:-

1. Understand the method of production and storage of liquefied petroleum gas.
2. Understand the principles of operation Bunsen burners and domestic gas cookers.
3. Understand the principles, functions and the constructional details of steel pipes and fittings used for steam and gas installations and carry out gas and steam work related to steel pipes and fittings in industries.
4. Know the various types of pipes and fittings used for steam and gas installations. Install a steam pipe system, providing adequate support and installation of the system.

PRACTICAL COMPETENCE On completion the students will be able to:

7 Install gas pipe work to feed suitable appliances.
8 To carry out installation of steam pipes
9 Carry out essential tests on completed installations.

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: Gas and Steam		**Course Code: CPP 204**			**Contact Hours**	
Course Specification: Theoretical Content						
WEEK	**General Objective: 1.0 Understand the method of Production and Storage of Liquefied petroleum Gas.**					
1	**Specific Learning Outcome**	**Teachers Activities**	**Resources**			
	Liquefied Petroleum Gas 1.1 Explain the method of production, transportation and storage of liquid petroleum gases. 1.2 State the various types of liquefied petroleum gases and their properties 1.3 State necessary safety precautions to be observed when storing, transporting and using L.P.G. 1.4Select the various types of fittings used with L.P.G. and their functions	– Explain the origin of L.P.G. and explain their production principles – Emphasize the need for safety and enumerate the safety precautions to be observed when storing and using L.P.G. Prepare notes – Enumerate various types of fittings used with L.P.G. and their functions.	▪ Charts and brochures depicting L.P.G. on display ▪ L.P.G. Plant	1.4 Carryout industrial visit to LPG plant.	- Explain different stages and processes involved in gas processing. -	- Gas Processing Plants
	General Objective 2.0: Understand the Principles of operation of Bunsen Burners and Domestic Gas Cookers.					
2	2.1 Explain the concept of combustion. **2.2** State the common products of combustion and means of controlling them **2.3** Discuss types of flames **2.4** Describe the principles of operation of Bunsen burners and gas cookers.	– Discuss combustion with flames and their applications – Explain hazard that are associated with combustion products and means of controlling them. – Explain the differences between Bunsen burners and gas cookers.	▪ Charts and brochures ▪ Bunsen Bonus, and laboratory experiment	2.5 Dismantle and assemble Bunsen burner and gas cooker. 2.6 Install Bunsen burner and gas cooker	- Identify component part and emphases their use. - Follow correct procedure for the installation	- Gas cookers - Bunsen burner - Pipe - Hoses - Relevant tools

	2.7 Identify the different methods of gas installations and know their advantages and disadvantages.	– Assess the students	▪ Gas cooker ▪ Sample of element ▪ Spark lighter	2.8 Construct and position platforms for receiving gas cylinders 2.9 Install gas pipe work to feed suitable appliances 2.10 Test using appropriate method to detect leakages and defective fittings.	– Demonstrate the construction of platforms for receiving gas cylinders and enumerate different methods of gas installations, stating the advantages and disadvantages	
	General Objective 3.0: Understand the Principles, functions and the Constructional details of Steam Generator					
3	3.1 Identify the types of steam generators 3.2 Explain the working principles of a steam generator 3.3 Describe the functions and constructional details of a steam generator	– Enumerate different types of steam generators and explain their functions – Give or produce pictorial and sectional sketches of steam generators , assess the students	▪ Brochures ▪ Charts.			

	General Objective 4.0: Understand the various types of pipes and fittings used for steam and gas installations.					
4	4.1 Explain the importance and usage of steam in manufacturing industry. 4.2 Differentiate the various types of steam e.g. wet, dry and superheated steam 4.3 Explain the purpose and types of insulation of steam pipes and fittings 4.4 Describe various types of pipes used for gas, water and steam installations 4.5 Describe the various types of valves used in steam installations. 4.6 Explain the reasons for insulating a steam pipe	– Enumerate the process of steam generation and identify various types, stressing the importance of each – Discuss the purpose of insulation and enumerate different types of insulating materials used for steam/heating work and their applications – State the various classes of pipes used for gas, and steam installations and describe the various valves and fittings used for steam installation. Prepare notes. Conduct visit to a boiler house	▪ Charts and brochures ▪ Sample of insulating materials, different valves on display ▪ Vehicles ▪ Brackets, fittings, ▪ Pipes, ▪ Insulator, ▪ General Tools	4.7 Carry out insulation of steam pipes 4.8 Visit an industry with Boiler House	▪ Guide the students while performing activities in 4.7. ▪ Supervise the students to report on their visit to boiler house.	- Boiler House - Relevant tools - Materials

PROGRAMME: **NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**

COURSE: **SERVICING AND MAINTENANCE OF PLUMBING APPLIANCES**

COURSE CODE: **CPP 301**

CONTACT HOURS:

GOAL: **This module is designed to provide the trainees with the knowledge and techniques of trouble shooting and maintaining plumbing appliances**

GENERAL OBJECTIVES: On completion of this module trainees should be able to:

1.0 Demonstrate the knowledge and repairs and maintenance of water heater
2.0 Understand the repairs and maintenance of pumps
3.0 Know how to service and repair a washing machine
4.0 Know how to service and repair a dish washer

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: SERVICING AND MAINTENANCE OF PLUMBING APPLIANCES			**Module:**		**Contact Hours:**	
Course Specification: Theoretical/Practical Contents						
WEEK	**General Objective 1.0: Demonstrate the knowledge of repair and maintenance of water heaters**					
1-4	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**
	1.1 Describe an orderly method of checking and testing a water heater 1.2 Discuss basic problem associated with water heater e.g. - sedimentation, - leaking, - noise, - electrical etc.	- Explain procedures for checking and testing water heater - Identify and explain problems associated with water heater	Textbooks Chalkboard Charts	1.3 Recognise the problems of water heater through its systems displayed by its equipment 1.4 Demonstrate the procedures for making repair, when problem are identified	The teacher should guide the students to identifying of: - No water is being heated - Insufficient amount of water - Leaking tank - Noise in the tank - To remove sediment from the tank and make sure valves (relief) work properly in releasing pressures	Water heater Charts

	General Objective 2.0: Understanding the repairs and maintenance of pumps					
	2.1 Describe the various types of pumps, and their uses. 2.2 Describe the component parts of pumps and their uses. 2.3 Discuss faults commonly experienced in pumps. 2.4 Identify tools required for pump maintenance. 2.5 Discuss troubleshooting procedures.	– Discuss pump types and their uses. – List component parts of pumps and their uses. – Explain common faults in pumps. – List tools required for pump maintenance. – Explain logical troubleshooting procedures.	Textbook Chart Chalkboard	– select tools for repair and maintenance of pumps – Check pumps for looseness and wear and replace worn parts if necessary	– Show students pump maintenance tools – Explain their use – Demonstrate the use of these tools to perform maintenance function – Guide students to carry out check for worn out part and replace them	Maintenance tools Pumps

	General Objective 3.0: understand the repair and service washing machines					
	3.1 Describe types of washing machines and the uses. 3.2 Describe component parts of washing machines and their uses. 3.3 Discuss the procedures of maintaining washing machine. 3.4 Discuss the maintenance of different components of washing machine. 3.5 Discuss the installation procedures for washing machines.	– Explain the process of maintaining different part of washing machine. – Explain the logical troubleshooting procedure. – Explain the logical installation procedure for washing machine.	- Chalkboard - Charts - Textbooks	– Follow the procedure for cleaning the washing machine – Disassemble the washer – Service washing machine timers and switches	– Guide the students to Demonstrate the cleaning of washing machine. – Guide the students to service the washing machine, timers and switches	- Washing Machine - Relevant tools
	General Objective 4.0: Understand the repairs and maintenance dish washers					
	4.1 Describe types of Dish washers and the uses. 4.2 Describe component parts of Dish washers and their uses. 4.3 Discuss the procedures of maintaining Dish washers. 4.4 Discuss the maintenance of different components of Dish washers. 4.5 Discuss the installation procedures for Dish washers.	– Explain the process of maintaining different part of Dish washers. – Explain the logical troubleshooting procedure. - Explain the logical installation procedure for Dish washers	- Chalkboard - Charts - Textbooks	– Follow the procedure for cleaning the Dish washers – Disassemble the washer – Service Dish washers timers and switches	– Guide the students to Demonstrate the cleaning of Dish washers. – Guide the students to service the Dish washers, timers and switches	- Dish washers Relevant tools

PROGRAMME: **NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**

COURSE: **ADVANCED PLUMBING SYSTEMS**

COURSE CODE: **CPP 302**

CONTACT HOURS:

GOAL: This module is designed to provide the trainees with knowledge and techniques of advanced plumbing system which enable them carry out the repairs and installation

GENERAL OBJECTIVES: On completion of this module trainees should be able to:

1.0 Understand the principles of spars, hot bath and swimming pools
2.0 Know basic components of spas, hot tubs and swimming pools
3.0 Know the component and materials used, lawn and garden sprinkler system
4.0 Know the operational principles and installation of air-conditioners

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: ADVANCED PLUMBING SYSTEMS			**Module: CPP 302**		**Contact Hours:**	
Course Specification: Theoretical/Practical Contents						
WEEK	**General Objective 1.0: Understand the principles of spars, hot tab (Jacuzzi) and swimming pools**					
1-4	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**
	1.1 Describe spas, hot tubs and swimming pools 1.2 Differentiate between spas and hot tubs 1.3 Describe basic components of spas and hot tubs and the similarities of both systems 1.4 Describe the operations and maintenance of spas and hot tubs 1.5 Describe the operations and maintenance of swimming pools 1.6 Explain the procedure for disinfecting swimming pools	– Explain spas, hot tubes and swimming pools. – Explain the difference between spas and hot tubes. – List component parts of spas and hot tubes and stating their uses. – Explain the operations and maintenance of spas and hot tubs – Explain the operations and maintenance of swimming pools. – Discuss the procedure for disinfecting swimming pools.	Textbooks Chalkboard Charts	1.7 Carryout maintenance operations on hot tubs, spas and swimming pools 1.8 Disinfect swimming pools.	- Demonstrate the maintenance procedures for hot tubs, spas and swimming pools. - Demonstrate the procedure for disinfecting swimming pools.	- Relevant tools and chemicals.
	General Objective 2.0: Understand the principles of Fish Ponds.					
	2.1 Describe Fish Ponds 2.2 Describe basic components of Fish Ponds. 2.3 Describe the operations and maintenance of Fish Ponds.	– Explain Fish Ponds. – Explain the difference between spas and hot tubes. – List component parts Fish Ponds and stating their uses. – Explain the operations and maintenance of Fish Ponds. –	Textbooks Chalkboard Charts	2.4 Carryout maintenance operations on fish ponds.	- Supervise students in the maintenance of fish ponds.	- Relevant tools - Fish Pond

	General Objective 3.0: Know the installation of spas and hot tubs					
	2.1 Describe the procedures involved in installing spas and hot tubs. 2.2 Describe the construction procedure of Swimming pools/ Fish ponds	– Explain the steps involved in installing spas and hot tubs – Show the students (through Site visit or videos) the construction of swimming pools/ fish ponds.		2.3 Install spas and hot tubs	- Guide the students to install spas and hot tubs.	- Spas - Hot tubs - Relevant tools - materials
	General Objective 4.0: Know the components and materials used in lawn and garden sprinkler system					
	4.1 Describe the differences between a sprinkler system and drip irrigation systems 4.2 List basic considerations for satisfactory operation of sprinkler 4.3 Explain the importance of pressure in the operation of sprinkler heads 4.4 Describe factors that can cause pressure loss 4.5 Describe the operation of the principle types of sprinkler 4.6 Describe the processes of designing laying out and installing of a lawn or garden sprinkler system	– Explain the differences between a sprinkler system and drip irrigation systems – Guide students to explain what is considered as satisfactory operation of sprinkler – Discuss the importance of pressure in the operation of sprinkler heads Guide students to: – Identify types of sprinkler – List types of sprinkler – Explain the processes involved in designing, laying out and installing a garden sprinkler system.	Charts Textbooks	4.7 Install a sprinkler system 4.8 Demonstrate the construction of basic sprinkler system. 4.9 Install a water fountain	- Guide students to install a basic sprinkler system - Supervise students to install a water fountain	- Sprinkler - Relevant tools

	General Objective 5.0: Know the operational principles and installation of air conditioners and install an air cool engine					
	5.1 Explain the need and the importance for the provision of air-conditioning system in buildings 5.2 Discuss the principles of operation of air-conditioning systems. 5.3 Explain the different types of air-conditioning systems 5.4 Explain a simple scheme for air-conditioning installation.	– List different types of air-conditioning systems and explain principles of operation of each. – Explain the essentials materials and fitting that are be needed in an air-conditioning installation. – Discuss the design procedure of a simple scheme for air-conditioning installation. – Explain and prepare notes.	Charts and brochure	5.5 Select equipment, materials and fittings for air-conditioning installation. 5.6 Install different types of air conditioning systems.	- Guide the students to install air conditioning systems.	- Installation tools. - Sample of Air-conditioner

PROGRAMME:	**NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**
COURSE:	Basic Electricity
COURSE CODE:	CHT 101
DURATION:	Hours/Week Theory: 2 hrs Practical : 2 hrs
UNIT:	4 hrs
TOTAL CONTACT HRS:	84
GOAL:	This designed to provide the learner with working knowledge in basic electricity

GENERAL OBJECTIVES: On completion of this course the learner should be able to:

1.0 Understand basic electricity

2.0 Understand the uses of Multi Meter

3.0 Understand the uses of Megger Tester

4.0 Understand the uses of Basic Electricity kits

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: Basic Electricity			**Course Code :**		**Contact Hours:** 84	
Course Specification: Theoretical/Practical Contents						
Goal: This course is designed to provide the learner with working knowledge of basic electricity						
Week	**General Objective: 1.0**					
	Specific Learning Outcome	**Teachers Activities**	**Resources**			
	1.1 Define basic electricity 1.2 Outline the characteristics of basic electricity 1.3 Define Ohm's law 1.4 Describe the impact of basic electricity to : (a) current flow (b) voltage and (c) resistance 1.5 Define simple D.C. circuits 1.6 State various types of energy and their inter-relationship 1.7 Define the concept of magnetism and magnetic circuits 1.8 Define the concept of electromagnetism and electromagnetic induction 1.9 Define the concept of inductance, capacitance, resistance and their applications 1.10 State the fundamentals of A.C. theory 1.11 Define Kirchoffs law and examine some circuits as it relates to Kirchoff's law	- Explain basic electricity - Explain the characteristics of basic electricity - Describe Ohm's law - Describe the impact of basic electricity to: (a) current flow (b) voltage and (c) resistance - Explain simple D.C. circuits - State various types of energy and their inter-relationship - Explain the concept of magnetism and magnetic circuits - Explain the concept of electromagnetism and electromagnetic induction	Chalkboard Magnetic board Charts	- Identify various voltages as it applies to the above. Namely: (a) single (b) 3-Phase - Use basic electricity kits to setup simple circuits, to determine current flow, voltage, etc. - Identify the sources of current flow of electricity with voltage and resistance	- Demonstrate basic electricity concept - Explain various voltages e.g. single, 3-Phases - Demonstrate the use of simple electric circuits to determine current flow, voltage, etc. - Show the sources of current flow of electricity	Chalkboard Magnetic board Charts

		- Explain the concept of inductance, capacitance, resistance and their applications - State the fundamentals of A.C. theory - Define Kirchoffs law and examine some circuits as it relates to Kirchoff's law				
	General Objective: 2.0 Understand the uses of Multimeter					
7-8	2.1 Define a multi-meter 2.2 State the uses of a multi-meter 2.3 State the colour codes	- Explain multi-meter - Explain the use of multi-meter - Explain the colour codes	Textbooks Diagrams Charts White board and Markers	- Identify a multi-meter - Use a multi-meter to determine: (a) the reading of various types of diode (b) the reading of various types of resistors	- Demonstrate the use of a multi-meter - Identify a multi-meter - Use a multi-meter to determine: (c) the reading of various types of diode (d) the reading of various types of resistors	Textbooks Diagrams Charts White board and Markers

	General Objective: 3.0 .Understand the uses of megger tester					
9-10	3.1 Define a megger-tester 3.2 State the uses of megger meter		Textbooks Diagrams Charts White board and Markers	Use transformers to determine how voltage is generated at the secondary windings		
	General Objective: 4.0 Understand the uses of basic electricity kit					
11-13	4.1 State the uses of basic electricity kit 4.2 Describe simple D.C. circuits 4.3 Define R-C oscillator	- Explain basic electricity kit - Explain simple D.C. circuits - Explain R-C oscillator	Textbooks Diagrams Charts White board and Markers	- Use basic electricity kits to determine the impedance (z) of capacitive, inductive and resistive loads of simple circuits - Use basic electricity kits to set up simple Network, to determine the current flows applying Kirchoff's law	- Demonstrate using basic electricity kits to determine the impedance (z) of capacitive, inductive and resistive loads of simple circuits	Textbooks Diagrams Charts White board and Markers
14	REVISION					

					- Demonstrate using basic electricity kits set up simple Network, to determine the current flows applying Kirchoff's law	

PROGRAMME: **NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**

COURSE: CONSTRUCTION DRAWING

COURSE CODE: 207

CONTACT HOURS:

GOAL: This module is designed to provide the trainees with the basic knowledge of construction drawing

GENERAL OBJECTIVES: On completion of this module trainees should be able to:

1.0 Identify various architectural drawing materials and equipments used in construction drawing

2.0 Understand symbols, conventions and other standard practices in construction drawing

3.0 Understand the basic principles of design of dwellings

4.0 Draw the site and floor plans, elevation and section of a proposed two bedrooms bungalow

5.0 Understand the purpose of scheduling.

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: CONSTRUCTION DRAWING			**Course Code: 207**		**Contact Hours:**	
Course Specification: Theoretical/Practical Contents						
WEEK	**General Objective 1.0 Identify various architectural drawing materials and equipments used in construction drawing**					
1-4	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**
	1.1 Describe various standard sizes of drawing papers and boards, and their uses 1.2 State the various drawing scale instruments used in construction drawing	- Discuss the various standard sizes of drawing papers and board - Explain the various drawing scale instrument such as architectural triangle, flat scales used in construction drawing	Chalkboard Charts Textbook Drawing board Drawing paper	- Identify the various sizes of drawing paper and drawing board - Identify various drawing scale and drawing instruments	- show various sizes of: a) drawing papers b) drawing boards - Show various scale rule and sets of drawing instruments	Drawing papers Drawing board Scale sule Sets of drawing instruments
	2.0 Understand symbols, conventions and other standard practices in construction drawing					
	2.1 Recognise and draw commonly used graphical symbols, lines and representation in construction drawing 2.2 Recognise various lettering styles 2.3 Explain essential information required in the title block and indicate them	- List and explain symbols, used in construction drawing - Show student the appropriate lettering styles in producing construction drawing - List essential information required in the title block	Chalkboard Charts Building drawing with various graphical symbols	- Draw graphical symbols used in construction drawing	- Draw and guide students to draw the graphical symbols	Chalkboard Chart of graphical symbols Drawing instruments

	2.4 Describe common dimensioning methods used in construction drawing with special emphasis on plumbing 2.5 State factors which govern the choice of scale and their ranges	- List and explain dimensioning methods used in construction - Explain the factors which govern the choice of scale and their ranges		- Draw various lettering styles - Draw correct title block - Use sketch to describe the methods of dimension used in construction drawing	lines and representation used in construction drawing - Draw and guide students to draw various lettering styles - Draw and guide students to draw title block - Sketch and guide students to sketch the dimensioning methods	Standard drawing papers
	3.0 Understand the basic principles of design of dwellings					
	3.1 Explain the basic parts of typical modern residential bungalow 3.2 Explain the functions of the basic parts of typical modern residential bungalow 3.3 State the basic design requirement of typical modern residential bungalow	- Discuss the parts of typical modern residential bungalow e.g. bedroom, bathroom, kitchen, etc. - Discuss the functions of the basic parts of typical residential bungalow e.g. bedroom, bathroom, kitchen, etc	Chalkboard Charts Textbook			

	3.4 Explain the typical water and sanitary services in bungalow	- Discuss the basic design requirement of typical modern residential bungalow e.g. bedroom, bathroom, kitchen, etc NOTE: Ditto with emphasis to plumbing installation - Discuss typical water and sanitary services in bungalow	Chalkboard Charts Textbooks	- Draw the installation of water and sanitary services	- Draw and guide students to draw the installation of water and sanitary services e.g. shower, wc, etc.	Drawing paper Charts Drawing instruments Drawing boards
	4.0 Draw the site and floor plans, elevation and section of a proposed two bedrooms bungalow					
	4.6 Explain floor plan and working drawings for a proposed 2-bedroom bungalow including plumbing services 4.7 Explain the elevational drawing for a 2-bedroom bungalow 4.8 Explain sectional drawing for a 2-bedroom bungalow 4.9 Explain site plan 4.10 Explain working drawing of septic tank and soakaway for a bungalow	- Discuss the content of floor plan and working drawings for a proposed 2-bedroom bungalow - Discuss the importance of elevational drawing for the 2-bedroom bungalow - State the reason for sectional drawing for the 2-bedroom bungalow - State the importance of site plan with emphasis to pipelines - Discuss the content of working drawing of septic tank and soak away for a bungalow	Chalkboard Floor plan Working drawing Textbook	- Prepare floor plan and working drawing of 2-bedroom bungalow - Prepare elevational drawing for a 2-bedroom bungalow - Prepare sectional drawing for 2-bedroom bungalow - Prepare site plan -	- Draw and guide students to draw floor plan and working drawing including plumbing services - Guide students to draw the elevational view of the floor plan drawn in 4.1 above -	Drawing papers Drawing instruments Drawing board

	4.11	-		- Prepare working drawing of septic tank and soak away for a bungalow	- Determine and guide students to draw sections for 2-bedroom bungalow - Draw and guide students to draw site plan indicating septic tanks, soak away, inspection chambers, pipelines, etc. - Draw and guide students to draw working drawing of septic tank and soak away	

	5.0 Understand the purpose of scheduling.					
	5.1 Explain the meaning of scheduling used in construction drawing 5.2 Explain the categories of information in schedule e.g. - specification of materials, component of activity - location of materials	- State the use of scheduling used in construction drawing - Stress the importance of information contained in schedules	Chalkboard Chart Textbooks Floor plan Codes	- Prepare schedules for the bungalow	- Guide students to prepare schedule for the bungalow e.g. plumbing -	Floor plans Codes

PROGRAMME: **NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING**

COURSE: INTRODUCTION TO BUILDING CONSTRUCTION

COURSE CODE:

CONTACT HOURS:

GOAL: The module is designed to introduce the trainee to basic construction principles, materials and methods, so that he can appreciate the roles of the various trades in building industry.

GENERAL OBJECTIVES: On completion of this module trainees should be able to:

1.0 Understand the use of timber materials

2.0 Understand the basic principles of site preparation

3.0 Understand setting –out principles

4.0 Understand the basic principles of foundation construction

5.0 Understand the basic principles of floor construction

6.0 Understand the basic principles of wall construction

7.0 Know materials and methods used in fixing opening

8.0 Understand the functions and principles of basic roof types

9.0 Understand the basic principles of stairway design

10.0 Know common types of finishes

11.0 Understand the basic principles of electrical installation services in dwelling

PROGRAMME: NATIONAL VOCATIONAL CERTIFICATE IN PLUMBING AND PIPE FITTING						
Course: INTRODUCTION TO BUILDING CONSTRUCTION			**Module:**		**Contact Hours:**	
Course Specification: Theoretical/Practical Contents						
WEEK	**General Objective 1.0 Understand the use of timber materials**					
1-4	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**
	1.1 Explain the various types of timbers 1.2 Explain the characteristics and uses of timbers 1.3 Explain the types of manufactured boards and uses	- Describe the various types of timbers - Discuss the characteristics and uses of timber - Describe the various types of manufactured board and state their uses	Chalkboard Charts Photographs Textbooks	- Identify various types of timbers - Identify various types of manufactured board	- Show to student different types of timber - Show to student different types of manufactured board	Timber Manufactured boards
	General Objective 2.0 Understand the basic principles of site preparation					
	2.1 Define Top-soil 2.2 Explain the hand tools and mechanical plant used for excavation 2.3 Explain the importance of site investigation and preparation prior to setting-out	- State reasons for removing Top-soil before setting-out - Describe the hand tools and mechanical plant used for excavation - Describe site preparation and procedures prior to setting-out	Chalkboard Charts Textbooks	- Identify Top-soil - Identify hand tools and mechanical plants	- Show students Top-soil on site - Take a visit to construction site with the students	
	General Objective 3.0 Understand setting –out principles					
	3.1 Define setting-out 3.2 Explain the method of pegging out the perimeter walls of a building	- State the procedures for setting- out - List the equipments required for setting-out	- Chalkboard - Building plan - Textbook	- Observe setting-out and pegging activities -	- Take students on a visit to construction site	Mobility Construction site

	General Objective 4.0 Understand the basic principles of foundation construction					
	4.1 Define foundation and state its purpose 4.2 Describe the various types of foundation 4.3 Describe temporary supports given to the sides of foundation trench 4.4 Describe the equipment and methods used in mixing concrete	- Discuss the reason for foundation - State the suitability of foundations on various soil types - State the reasons for temporary supports given to the sides of foundation - List equipments and methods used for mixing concrete	Chalkboard Charts Textbooks	- Observe foundation construction - Observe concrete mixing methods using various equipments	- Take students on a visit to construction site	Mobility Construction site
	General Objective 5.0 Understand the basic principles of floor construction					
	5.1 Explain the functions of floors 5.2 Explain the various types of floors and construction methods	Describe the functions of floors Describe how various types of floor are constructed	Chalkboard Charts Textbooks Pictures	- Observe construction of floor	- Take students on a visit to construction site	Mobility Construction site
	General Objective 6.0 Understand the basic principles of constructing wall					
	6.1 Explain the functions of external and internal walls 6.2 Explain various types of walls and their unit in common use 6.3 Explain the functions, method of placing and positioning of D.P.C. in walls	- Differentiate between internal and external wall - Describe walls and their units - Describe how D.P.C. is placed/positioned in walls	Chalkboard Charts/Pictures Textbooks	- Observe construction of various walls	- Take students on site visit to construction site	Mobility Construction site

	General Objective 7.0 Know materials and methods used in fixing opening					
	7.1 Explain the functions of openings in dwellings 7.2 Explain various types of doors and windows and their mode of operation 7.3 Explain various types of ironmongeries ad state their uses	- State the functions of openings in dwelling e.g. lighting, ventilation, privacy, etc. - Describe types of doors and windows including their mode of operation - List various types of ironmongeries	Chalkboards Charts/Pictures Brochures	- Identify various types of doors and windows	- Take students on a visit to various manufacturers/ retailers	Mobility Retailers
	General Objective 8.0 Understand the functions and principles of basic roof types					
	8.1 Define various basic roof types 8.2 Explain the materials maximum allowable span for various roof types 8.3 Describe different roof covering and their uses	- List various roof types, e.g. concrete roofs, trusses double roof, etc. - Describe the maximum allowable span for various roof types considering material types - List various roof coverings suitable for tropical use	Chalkboard Charts	- Identify various roof types - Identify various roof coverings	- Take students on a visit to sites - Do -	Mobility Sites
	General Objective 9.0 Understand the basic principles of stairway design					
	9.1 Explain different types of stairs 9.2 Explain the design standards for the construction of stairs	- List various types of stairways - Differentiate stairs based on construction and materials, e.g. straight flight, open well, steel staircase, etc. - Describe the design standard of stairways e.g. rise-tread relationship, min. headroom, etc.	Chalkboard Charts/Pictures Textbooks	- Identify various types of stairways	- Take students on a visit to sites	Mobility Sites

	General Objective 10.0 Know common types of finishes					
	10.1 Describe different wall and joinery finishes 10.2 Explain the functions and types of ceilings	- List the common types of wall and joinery finishes, e.g. wall tiles, paint, wall paper, wood vanish, wood polish, etc. - Describe various types of ceiling and their finishes used in tropics e.g. normal ceiling and suspended ceiling, etc.	Chalkboard Colour charts Brochure Textbook	- Identify various types of wall and joinery finishes - Identify various types of ceiling	- Take students on a visit to sites - Do -	Mobility Sites
	General Objective 11.0 Understand the basic principles of electrical installation services in dwelling					
	11.1 Explain the mode of supply and installation systems of electricity in dwellings 11.2 Explain various electrical fixtures and state their functions 11.3 Explain the precautions to be taken to ensure safe electrical installation in dwelling 11.4 Explain the way of interpreting electrical circuit symbols and drawings	- Describe the mode of supply and installation of electrical systems in dwellings e.g. single phase, 2-phase (conduit and surface wiring) - Describe the various electrical fixtures - Discuss the safety precautions to be taken as for electrical installation in dwelling - List electrical symbols as included in drawing	Chalkboard Brochure Pictures	- Identify electrical installation systems - Identify various electrical fixtures - Demonstrate the safe way of handling/ fixing of electrical installation in dwelling - Identify electrical symbols	- Show to students the systems of electrical installation by site visit - Do – - guide students on the safe way of handling electrical installation - Take students on a visit to sites	Mobility Sites

LIST OF TOOLS AND EQUIPMENT
FOR NVC PLUMBING AND PIPE FITTING

S/NO	TOOLS	MINIMUM QUANTITY REQUIRED	QUANTITY AVAILABLE	ADDITIONAL QUANTITY REQUIRED
1	Measuring tapes	25		
2	Try Squares	25		
3	Plumbs	10		
4	Hacksaws	25		
5	Portable drilling machine	8		
6	Flat files	15		
7	Half round files	15		
8	Triangular files	15		
9	Round files	15		
10	Cold chisels	25		
11	Centre punch	25		
12	Chain pipe cutter	25		
13	Reamer	10		
14	Pipe stock and dies	10		
15	Pipe wrenches No. 12	25		
16	Pipe wrenches No. 14	25		
17	Pipe wrenches No. 16	25		
18	Pipe wrenches No. 18	25		
19	Pipe wrenches No. 24	12		
20	Pipe wrenches No. 36	6		
21	Chain wrenches	12		
22	Pipe vice	12		
23	Electric Arc welding machine	4		
24	Welding shield	12		
25	Wire brush	25		

26	Adjustable spanner	25		
27	Pliers	25		
28	Screw drivers (assorted)	25		
29	Ball pain hammers	25		
30	Small hammers	25		
31	Diggers	12		
32	Pipe bending machine	12		
33	Shovels	12		
34	Ladders	6		
35	Centrifugal pumps	4		
36	Complete set of Oxy-acetylene welding equipment	2		
37	Sets of spanners	12		
38	Spark lighter	2		
39	Protective wears: - helmet - welding goggles - white goggles - nose protectors - boots	 25 25 25 25 25		
40	Portable grinder	8		
41	Fire extinguishers	4		
42	Pressure gauge	4		
43	Bending spring	12		
44	Fire sand bucket	6		
45	Dish washer	2		
46	Washing machine	2		
47	Air conditioners split	2		
48	Air conditioners window	1		
49	Spacing clips			

CONSUMABLES MATERIALS

1. Various sizes of Pvc pressure pipes
2. Various sizes of Pvc pressure fittings
3. Various sizes of G. I. pipes
4. Various sizes of G. I.. fittings
5. Various sizes of Pvc Non-pressure pipes
6. Various sizes of Pvc Non-pressure fittings
7. Pipe jointing materials:
   - Gums - 30 tins
   - Plumbers mate – 20 tins
   - Yarn ropes – 30 bundles
8. Oxygen gas – 2 cylinders (200 bars each)
9. Acetylene gas - 2 cylinders (200 bars each)
10. Taps and valves
    - Bib taps 12
    - Pillar taps 12
    - stop cocks 12
    - Gate valves 12
    - Air valve 4
    - Plug tap 12

11. Sanitary appliances

- WHB 4
- Bath 4
- Kitchen sink 4
- Shower tray 4
- Urinals (bowl and stall) 2
- Automatic flushing cistern 2

LIST OF RECOMMENDED TEXT BOOKS

a. Plumbing: Heating and Gas Installations 2nd Edition, By R. D. TRELOAR. Blackwell Science Publishers

b. Plumbing, By F. HALL

c. Plumbing Technology, By F. HALL

d. Plumbing 1 & 2, By A. L. TOWNSEND

e. Plumbing: For Level 2 Technical Certificate and NVQ, By Steve Muscroft

f. Complete plumbing: By Stanley

g. R. D. Treloar 3rd Edition: Heating and Gas Installation, By Roy Treloar

h. Mechanical Services Book 1, By Gordon Blower.

i. 2006 International Plumbing Codes, By R. Dodge Woodson

EXPERT GROUP

PARTICIPANTS

S/NO	NAME	ADDRESS	e-mail	GSM
1.	SEGUN FATOKI	HIGHLAND COLLEGE OF TECHNOLOGY, IBADAN	Infoehighlandcollegeng.com	08033502136
2.	ENGR. YUSUF YAKUBU	NBTE, KADUNA	yuseefy@yahoo.com	08089338956
3.	OLUBODE D. MAJIYAGBE	NBTE, KADUNA	dannymajis@yahoo.com	08037042826
4.	LAWAN ABDULKARIM	NBTE, KADUNA	lawannbte@yahoo.co.uk	08037013711

CRITIQUE WORKSHOP

PARTICIPANTS

S/NO	NAME	ADDRESS	e-mail	GSM
1.	ABDULMUMINI J. HARUNA	PLANT AND WATER WORKS, ZARIA	Abdulmuminiharuna@yahoo.com	08033607249
2.	SEGUN FATOKI	HIGHLAND COLLEGE OF TECHNOLOGY, IBADAN	Infoehighlandcollegeng.com	08033502136
3.	ILIYA MUSA BARI	GOVERNMENT TECHNICAL COLLEGE, WUDIL, KANO STATE	iliyamusabari@yahoo.com	08065670999
4.	ENGR. YUSUF YAKUBU	NBTE, KADUNA	yuseefy@yahoo.com	08089338956
5.	OLUBODE D. MAJIYAGBE	NBTE, KADUNA	dannymajis@yahoo.com	08037042826
6.	LAWAN ABDULKARIM	NBTE, KADUNA	lawannbte@yahoo.co.uk	08037013711
7.	DR. M. S. ABUBAKAR	DIRECTOR PROGRAMMES, NBTE, KADUNA		
8.	ENGR. (DR.) NURU YAKUBU, *OON*	EXECUTIVE SECRETARY, NBTE, KADUNA		