1.

A COURSE OUTLINE

IN

PLUMBING

FOR THE TECHNICAL INSTITUTES IN GUYANA

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COURSE TITLE: **PLUMBING**

COURSE LEVEL: **CRAFT CERTIFICATE**

PRE-REQUISITES:

1. Applicants must be fifteen (15) years and over and be successful at the Secondary School Proficiency Examination Part 1 & 2.
2. Must be successful at the selection test.

COURSE DURATION:

The duration of the course is two (2) years for full-time students and three (3) years for part-time students.

COURSE OBJECTIVES:

To provide student with the knowledge and application of relevant Technology, Practical skills Science and calculation in the Plumbing field.

TEACHING/LEARNING STRATEGY

To assist students to acquire the understanding of the principles of Plumbing through:

(a) Specific studies in relation to the subject mentioned in the course content
(b) Practical skills in relation to the field in which he/she will be trained.
(c) Developing student ability to communicate and explain to his or her customers the plan of action required to complete the job undertaken.

ASSESSMENT

50% Theory

50% Practical

RECOMMENDED TEXTS

1. PLUMBING 1	BY AL. TOWNSEND
2. PLUMBING 11	BY AL. TOWNSEND
3. CALCULATIING FOR PLUMBERS	BY W.G. DAWES AND R. ILLSLEY
4. PLUMBING	BY FEDRICK HALL
5. PLUMBING COLD AND HOT WATER	BY FEDRICK HALL
6. BUILDING SCIENCE	BY NOBBS
7. CONSTRUCTION OF BUILDINGS	BY BARRY VOLUMES I-IV

COMPETENCY LIST

1. PIPE WORK MATERIALS

(A) Describe physical properties of materials.
(B) List composition of solder, melting point and uses of solder.
(C) Explain purposes, types and uses of fluxes.
(D) Identify types, uses and specification of pipes.
(E) Sketch various types of joints.
(F) Describe methods of fixing pipes.
(G) Describe alloys and plastics.

SHEET METAL WORK

(A) Describe types of materials used on roof work.
(B) Identify the gauge of roof work materials.
(C) Explain the purpose of gutters on a building.
(D) Install gutters and downpipes.
(E) Describe various types of gutters.
(F) Develop and layout square, rectangular and cylindrical projects.

WATER SUPPLY

(A) Explain rain cycle.
(B) Identify common sources of water supply.
(C) Classify water from its various sources.
(D) Sketch common sources of supply.
(E) Analyse water from its common sources.
(F) List water main fittings.
(G) Sketch joints for water main.
(H) Illustrate connection of service pipe to main.
(I) Describe types of pumps.
(J) Differentiate between constant and intermittent water supply.
(K) Sketch direct, indirect and modified indirect, domestic system of water supply.
(L) Lay underground service pipes.
(M) Identify types of valves, cocks and fittings.
(N) Install taps, valves, and cocks.
(O) Sketch cold water storage cistern.
(P) Explain functions of cold water storage cistern and warning pipe.
(Q) Identify the causes of noise in cold water system.

HOT WATER SUPPLY

(A) Explain circulation of water in pipes, boilers and cylinders.
(B) Differentiate between the direct and indirect system of domestic hot water supply.
(C) Explain the purpose of storage feed and expansion cisterns.
(D) Explain secondary circulation and heating (Primary) circuits.
(E) Identify common faults in hot water system.
(F) Sketch combine cylinder and tank system.

DIFFERENTIATE BETWEEN LOCAL AND CENTRAL SYSTEMS SANITARY APPLIANCES

(A) Identify materials used for sanitary appliances.
(B) Describe the functions of bath, basin, wash down and siphonic water closet, sinks, urinals, showers, drinking fountain etc.
(C) List types and function of flushing cistern and their fixing.

ABOVE GROUND DRAINAGE

(A) List sizes, jointing method and fixing of soil, waste and vent pipe to domestic and small public buildings.
(B) Connect soil and waste pipe to drainage system.
(C) Identify types of traps and materials from which they are made.
(D) Describe methods of maintaining trap seals.
(E) Illustrate one pipe, two pipe and single stack system of drainage.

BELOW GROUND DRAINAGE

(A) Explain principles and terms used in Drainage system.
(B) Sketch systems of drainage.
(C) Sketch connection of drains.
(D) Sketch ventilation of drains.
(E) Sketch manholes and inspection chambers.
(F) Test drainage systems.
(G) Sketch and describe the functions of pit-latrine, septic tank and cesspool.

SOLDERING, BRAZING AND WELDING

(A) Join copper tubes with solder.
(B) Butt and filler weld metals up to 5mm thickness.
(C) Sketch and explain the use of oxy-acetylene cylinders.
(D) Describe characteristics of flames.
(E) Differentiate between brazing and bronze welding.

SCIENCE

(A) Discuss capillary attraction.
(B) Discuss evaporation
(C) Describe atmosphere corrosion
(D) Explain the atmospheric
(E) Explain temperature and temperature scales
(F) Convert temperature **scales**
(G) Identify quality of water
(H) Discuss physical properties of water
(I) Calculate water pressure
(J) Discuss thermal insulation
(K) Explain siphonic action
(L) Explain methods of heat transfer
(M) Discuss the makeup and behaviour of plumbing materials.

CALCULATION

(A) Solve decimals and vulgar fraction
(B) Transpose formulae
(C) Calculate ratio and proportion
(D) Calculate average
(E) Use four figure tables
(F) Solve problems on mensuration
(G) Calculate percentage
(H) Calculate volume

APPLIED PLUMBING PRACTICE

(A) Discuss safety regulations
(B) Use of basic hand tools
(C) Demonstrate joints used on various types of pipes
(D) Demonstrate methods of fixing various types of pipes
(E) Construct welts and seams
(F) Use of sheet aluminium for simple projects
(G) Use sheet galvanize for simple projects
(H) Install sanitary appliances/fixtures
(I) Connect soil and waste pipes to drains

ENGLISH

1. Use correct grammar
2. Develop reading and comprehension skills
3. Analyse composition
4. Develop letter writing and technical report skills

TECHNICAL DRAWING

1. Explain Technical Drawing
2. Employ lettering and figure writing
3. Discuss required instrument for Technical Drawing
   (a) Working on Drawing boards
   (b) Employ lettering and figure writing
   (c) Discuss required instrument for technical drawing
      (a) Working on drawing boards
      (b) Using the instrument

(d)Develop parts of circle

(e)Construct plane figures

(f)Construct isometric drawings

(g)Construct first angle projection

PERFORMANCE TASKS

PIPE WORK MATERIALS

(A) Define meaning of physical properties of materials used in Plumbing.
(B) Describe types of materials used in Plumbing.
(C) List tables of properties for materials

LIST COMPOSITION, MELTING POINT AND USES OF SOLDER

(A) Discuss the difference between hard and soft solders.
(B) List tools used for soldering.
(C) Explain melting point of solder.
(D) Explain plastic range of solder.
(E) Describe the temperature of solder for wiping.
(F) Explain purification of solder.
(G) Sketch methods of soldering.

EXPLAIN THE PURPOSE AND TYPES OF FLUXES

(A) List the purpose of a flux.
(B) List types of fluxes.
(C) State what materials fluxes are used on.
(D) Define safe flux.

IDENTIFY TYPES, USES AND SPECIFICATION OF PIPES

(A) List types of pipes used in the plumbing industry.
(B) List uses of pipes in plumbing.
(C) List specifications of pipes in plumbing
(D) Sketch methods of jointing, various types of pipes used in plumbing.
(E) Describe methods of fixing pipes

DESCRIBE ALLOYS AND PLASTIC

(A) Define Brasses and Gunmetal, Solder, Steel etc.
(B) Define PVC – ABS Polythene etc.

LIST WATER MAIN MATERIALS

(A) Name materials for water mains.
(B) Sketch joints for water mains.
(C) Illustrate connections to water main.
(D) List types and uses of water main fittings.

ISSUSTRATE CONNECTIONS OF SERVICE PIPE TO MAIN

(A) Sketch and explain communication pipe connection.
(B) Explain method of laying service pipe.

DESCRIBE TYPES OF PUMPS AND THEIR USES

(A) Sketch the various types of pumps.
(B) Explain operation of various types of pumps.

DIFFERENTIATE BETWEEN CONSTANT AND INTERMITTENT WATER SUPPLY

(A) Define constant and intermittent supply.
(B) Sketch and describe direct, indirect and modify indirect system of Domestic Cold Water Supply.
(C) Explain advantages and disadvantages of the systems.

LIST TYPES OF TAPS, VALVES AND COCKS

(A) Define screw down taps and valves
(B) List types of taps and valves.
(C) Sketch types of taps and valves.
(D) Sketch types and explain purpose of BALLVALVE
(E) Explain common faults in ball valves
(F) Explain the operation of taps, valves and cocks

SKETCH COLD WATER STORAGE CICTERN

(A) Explain the function and use of cold water storage cisterns.
(B) List steps to be considered when installing cisterns.
(C) Identify types of materials for cisterns.
(D) Explain steps to be considered when water is stored for consumption.

HOT WATER SUPPLY

(A) Discuss how convection currents occur within pipes, boilers and cylinders.
(B) Sketch simple systems with boilers, circulating pipes and cylinders.
(C) Explain how the water in the cylinder is heated by Electricity and gas.
(D) Discuss how reverse circulation takes place and how it can be corrected.
(E) Define circulating pressure or head.

DIFFERENTIATE BETWEEN DIRECT AND INDIRECT SYSTEM DOMESTIC HOT WATER SYSTEM

(A) Sketch and explain direct system.
(B) List important points to be considered when designing the direct and indirect system.
(C) Sketch and explain indirect system.
(D) Explain the purpose of the direct system.

EXPLAIN PURPOSE OF STORAGE FEED AND EXPANSION CISTERN

(A) State the purpose of storage feed and expansion cisterns.
(B) Sketch indirect cylinder.

EXPLAIN SECONDARY CIRCUIT AND PRIMARY HEATING CIRCUIT

(A) Define Secondary Circuit.
(B) Define Primary heating circuit.

IDENTIFY COMMON FAULTS IN HOT WATER SYSTEM

(A) List common faults in hot water system.
(B) Explain air locks, insufficient hot water, noises and poor flow of water.

SKETCH COMBINE CYLINDER AND TANK SYSTEM

(A) State the use of combine cylinder and tank system.
(B) State the purpose of combine cylinder and tank system.
(C) Sketch combine cylinder and tank system for a four story building.
(D) Sketch combine cylinder and tank system for a single story where taps are situated some distance from each other.
(E) Explain thermostatic control to shower baths.
(F) Sketch an elevation of a thermostatically controlled mixing valve for a shower.
(G) Explain a shower bath in installation.
(H) Sketch horizontal cylinder

SANITARY APPLIANCES

Describe bath, basin, w.c, sinks, bidets, urinals, showers.

(A) List materials used for each of the sanitary appliances.
(B) Explain the difference between soil appliances and waste appliances.
(C) List requirements for sanitary appliances.
(D) Discuss precautious taken for sanitary appliances on site.
(E) Sketch types of overflow for sanitary appliances.
(F) Demonstrate fixing for sanitary appliances.
(G) State diameter of outlet for sanitary appliances.
(H) Connect soil and waste pipe to drainage system.

LIST TYPES OF CISTERN AND THEIR FIXING

(A) Name different types of flushing cisterns.
(B) Define flushing cistern.
(C) Identify materials used for flushing cisterns.
(D) Demonstrate fixing for cistern

LIST TYPES OF TRAPS AND MATERIALS FROM WHICH THEY ARE MADE

(A) Define the function of a trap.
(B) Name materials used for traps.
(C) State the requirements for traps.
(D) List different types of traps.
(E) Describe ways of unsealing traps.
(F) Sketch ways of unsealing traps.
(G) Explain purpose of resealing traps.
(H) Sketch types of resealing traps.
(I) List types of resealing traps.

DRAINAGE BELOW GROUND

Explain principles of drain.

(A) Define a drain.
(B) List principles of a good drainage system.
(C) Sketch simple layout of drainage systems.
(D) Describe septic tank.
(E) Describe pit latrines.
(F) Describe chess pool.

DRAINAGE ABOVE GROUND

(A) Discuss systems used for above ground drainage.
(B) Differentiate among one pipe, two pipes and single stack systems.
(C) Discuss the one pipe system.
(D) Discuss the two pipes system.
(E) Discuss the single stack system.

SOLDERING, BRAZING AND WELDING

(A) Sketch Oxy-Acetylene cylinders and explain safety precautions.
(B) Describe oxygen cylinder.
(C) Describe acetylene cylinders.
(D) List the steps to be taken in assembling and operating the equipment.
(E) Describe types of flames, carburising, oxidising and neutral.
(F) Differentiate between fusion on brazing and bronze welding.

SCIENCE

Explain the Primary Fundamental and basic units of the S.I Metric System.

(A) Describe derived units.

DISCUSS CAPILLARITY AND EVAPORATION

(A) Discuss capillarity attraction.
(B) Discuss condensation.
(C) Discuss evaporation.
(D) Discuss dew point.
(E) Explain damp proof course (D.P.C).

DESCRIBE CORROSION AND ITS TREATMENT

(A) Discuss composition of air
(B) Discuss properties of air.
(C) Explain atmospheric pressure
(D) Define atmospheric corrosion.
(E) State types of protective coatings applied to metals

EXPLAIN WATER

(A) Discuss properties of water.
(B) Explain maximum density of water.
(C) Discuss behaviour of water.
(D) Define specific gravity.
(E) Define water pressure

EXPLAIN TEMPORARY HARDNESS AND PERMANENT HARDNESS OF WATER

(A) Explain hard water.
(B) Explain soft water.
(C) Explain the difference between temporary and permanent hardness.
(D) Explain the effects of hard water.
(E) Explain the effects of impurities in water
(F) Explain purification processes of water

EXPLAIN HEAT AND ITS EFFECTS ON AIR AND WATER

(A) Discuss transmission of heat.
(B) Sketch how heat can be transmitted.

DISCUSS MAKE-UP AND BEHAVIOUR OF PLUMBING MATERIALS

(A) Define matter.
(B) Explain physical properties of matter.
(C) Explain chemical properties.
(D) Explain the chemical composition of matter.

DEFINE HEAT AND ITS MEASUREMENTS

(A) Define heat.
(B) Define thermometers and temperature scales.
(C) Convert temperature scales.
(D) Explain quantity of heat.
(E) Explain coefficient of thermal expansion.
(F) List the effects of heat.

DISCUSS THERMAL INSULATION

(A) Explain purpose of thermal insulation.
(B) Explain properties of insulating materials.

DISCUSS SIPHONIC ACTION

(A) Explain siphonage.
(B) Discuss siphonic action within flushing cistern.

TECHNICAL DRAWING

INTRODUCTION TO TECHNICAL DRAWING

(A) Define Technical Drawing

REQUIREMENTS (TOOLS) FOR TECHNICAL DRAWING

(A) Tee Square, Set Square, Drawing Set, Drawing Pins or tape and Drawing Paper.

WORKING ON DRAWING BOARD

(A) Securing your paper.
(B) Cleaning of the paper.
(C) Causes and remedies of dirt on the paper.

USING THE TOOLS

(A) Horizontal lines.
(B) Vertical lines.
(C) Diagonal lines

SOLIDS

(A) Cone, Pyramid, Cubes, Circles, Rectangle and Prism.

GEOMETRY

(A) Bisecting of straight lines.
(B) Bisecting of angles.
(C) Constructing of angles.

SOLID CONSTRUCTION

CONSTRUCTION OF POLYGONS

(A) Pentogon
(B) Hexogon
(C) Oxtogon
(D) Nonogon

ISOMETRIC DRAWING

Drawing of various figures

(A) Channel blocks
(B) Solid stair
(C) Angle blocks

FIRST ANGLE PROJECTION

Elevation of all Isometric shapes

CALCULATION - Solve Decimal and Vulgar Fraction

(A) Calculate L.C.M. and H.C.F
(B) Calculate Addition and Subtraction of Vulgar Fraction.
(C) Multiplication and Division of Vulgar Fraction.
(D) Conversion of Vulgar Fractions to Decimal Fraction.
(E) Calculate Addition, Subtraction, Division and Multiplication of Decimal Fraction.

TRANSPOSE FORMULA

(A) Calculate Ratio and Proportion.
(B) Calculate Averages.
(C) Calculate Percentages.

USE FOUR FIGURE TABLES

(A) Find Characteristics.
(B) Find Mantissa.
(C) Evaluate Logs.

SOLVE PROBLEMS ON MENSURATION

(A) State Formula for Area of Rectangles and Squares.
(B) Calculate Areas of Rectangles and Squares.
(C) State Formula for Triangles and Trapezium.
(D) Calculate Area of Triangles and Trapezium.
(E) State Formula for Area and Circumference of Circles.
(F) Calculate Area and Circumference of Circles.
(G) State Formula for Volumes.
(H) Calculate Capacities.

APPLIED PLUMBING PRACTICE

APPLIED SAFETY PRECAUTIONS

(A) Use of protective clothing.
(B) Demonstrate safety of tools and machinery.
(C) Demonstrate safety and use of ladders and scaffolds.
(D) Observe out general safety precautions within workshop.

Use plumbing machine

(A) Demonstrate correct use of machine.

USE HAND TOOLS

(A) Demonstrate correct use of hand tools.
(B) Sketch hand tools.
(C) Define hand tools.
(D) Care of hand tools.

DEMONSTRATE JOINTS FOR VARIOUS TYPES OF PIPES, SCREW JOINTS

(A) Select suitable pipes for screw joints.
(B) Cut pipes by means of pipe cutter or hack saw.
(C) Ream pipe to remove burrs.
(D) Thread pipes by means of stock and die.
(E) Assemble pipe by the use of fittings.

CAPILLARY JOINTS

(A) Select copper pipe for capillary joint.
(B) Cut pipe by means of pipe cutter or hack saw.
(C) Ream pipes to remove burrs.
(D) Clean pipe to remove oxide.
(E) Apply flux and insert pipe into fitting.
(F) Heat pipe and fitting and apply solder.

LEAD JOINT

(A) Select pipe for lead joint.
(B) Cut pipe to required length.
(C) Ream pipe to remove burrs.
(D) Rasp down the closed end to feather edge.
(E) Open socket end with turn pin.
(F) Rub ends with chalk and apply tarnish.
(G) Scribe around pipe with dividers.
(H) Fit the two ends together and apply tallow.

MAKE SINGLE LOCK, DOUBLE LOCK, STANDING SEAM AND SEAMS

(A) Layout materials.
(B) Fold materials.
(C) Assemble materials to complete project.

USE OF SHEET ALUMINIUM FOR SIMPLE PROJECTS

(A) Square and rectangle projects.
(B) Circular projects.

USE OF GALVANIZED FOR SIMPLE PROJECTS

(a) Square and rectangle projects.
(b) Circular projects

INSTALL SANITARY APPLICANCES AND FIXTURES

Correct installation procedures for various appliances

Connect soil and waste pipes to drains.

COURSE TITLE: PLUMBING

COURSE LEVEL: **ADVANCE CRAFT CERTIFICATE**

PRE-REQUISITE:

(A) Applicants must be eighteen (18) years and over.
(B) Successful at Craft Certificate in Plumbing.
(C) One year relevant Industrial Experience in Plumbing.

COURSE OBJECTIVE

1. To develop the students' ability to absorb, interpret and transmit information, whether in spoken or written form.
2. To contribute to General Education and Personal Development.
3. To develop specialised knowledge of one or more aspect of the subject area.