GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

**COMPETENCY BASED CURRICULUM**

# PLUMBER

**(Duration: One Year)**

## CRAFTSMEN TRAINING SCHEME (CTS)

## NSQF LEVEL- 4

## SECTOR – CONSTRUCTION, CONSTRUCTION MATERIAL & REAL ESTATE

# PLUMBER

**(Engineering Trade)**

**(Revised in 2018)**
**Version: 1.0**

## CRAFTSMEN TRAINING SCHEME (CTS)

## NSQF LEVEL- 4

Skill India
कौशल भारत-कुशल भारत

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
**CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE**
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| List of Expert members participated in preparation of course curriculum of Plumber trade held on 12.12.17 to 15.12.17 at CSTARI, Kolkata | | | |
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| 36 | Shri. Sugesh K, Jr. Instructor, ITD, Kerala | Member |

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# 1. COURSE INFORMATION

During the one year duration a candidate is trained on subjects Professional Skill, Professional Knowledge, Engineering Drawing, Workshop Science & Calculation and Employability Skills. In addition to this a candidate is entrusted to make/do project work and Extra Curricular Activities to build up confidence. The practical skills are imparted in simple to complex manner & simultaneously theory subject is taught in the same fashion to apply cognitive knowledge while executing task. The practical part starts with basic pipe work viz. cutting of pipes, threading, joining, etc. and finally to fitting, fixing and laying of hot & cold water pipe line, repairing and reconditioning of waste pipe line at the end of the course. The broad components covered under Professional Skill subject are as below:

**1st Semester -** The practical part starts with basic fitting in the beginning and the candidate imparted training on allied trades viz., carpenter, Welding (Gas & Arc), Masonry which leads to multi-skilling. In the basic fitting the skills imparted are marking, sawing, chipping, filing, measurement, soldering, brazing, drilling, grinding and observation of all safety aspects is mandatory. The accuracy achieved is of ±0.25 mm. The safety aspects covers components like OSH&E, PPE, Fire extinguisher, First Aid etc. Cutting Pipes in different angle. Joining of pipes of different diameter and angles by gas welding, thread cutting on different types of pipes & fittings accessories. Making of brick wall and RCC casting. Brick wall cutting for concealing pipe line. Bending of Pipes, Making of pipe line circuit for water distribution, fixing Cocks & valve, Water analysis test, Water Pressure test are being taught.

**2nd Semester -** In this semester alignment and laying of humed asbestos pipeline & maintenance of drainage pipe line. Installation and maintenance of Electric pumps, Construction of inspection chamber, manhole, gutter, septic tank, socket etc. Testing of drainage pipe , Removal of leakage pipe line, Installation, fixing & maintenance of valve & cock, water meter, Fixtures, hot & cold water pipe line, Repairing & reconditioning of waste pipe line, Repairing & reconditioning, scraping & painting of sanitary fittings are being taught in the practical.

Professional Knowledge subject is simultaneously taught in the same fashion to apply cognitive knowledge while executing task. In addition components like Physical properties of engineering materials, different types of iron, properties and uses, Heat & Temperature are also covered under theory part.

Total three projects need to be completed by the candidates in a group. In addition to above components the core skills components viz., Workshop calculation & science, Engineering drawing, employability skills are also covered. These core skills are essential skills which are necessary to perform the job in any given situation.

# 2. TRAINING SYSTEM

## 2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

Plumber trade under CTS is one of the popular courses delivered nationwide through network of ITIs. The course is of one year (02 semester) duration. It mainly consists of Domain area and Core area. In the Domain area (Trade Theory & Practical) impart professional - skills and knowledge, while Core area (Workshop Calculation science, Engineering Drawing and Employability Skills) imparts requisite core skills, knowledge and life skills. After passing out of the training program, the trainee is awarded National Trade Certificate (NTC) by NCVT which is recognized worldwide.

**Broadly candidates need to demonstrate that they are able to:**

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

## 2.2 CARRIER PROGRESSION PATHWAYS

- Can take admission in diploma course in notified branches of Engineering by lateral entry.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.

## 2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year (02 semesters):-

| S No. | Course Element | Notional Training Hours |
|---|---|---|
| 1 | Professional Skill (Trade Practical) | 1050 |
| 2 | Professional Knowledge (Trade Theory) | 252 |
| 3 | Workshop Calculation & Science | 84 |
| 4 | Engineering Drawing | 126 |
| 5 | Employability Skills | 110 |
| 6 | Library & Extracurricular activities | 58 |
| 7 | Project work | 160 |
| 8 | Revision & Examination | 240 |
| | **Total** | **2080** |

## 2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of the course and at the end of the training program as notified by the Government of India (GoI) from time to time. The employability skills will be tested in the first two semesters itself.

a) The **Internal Assessment** during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NTC will be conducted by NCVT at the end of each semester as per the guideline of Government of India. The pattern and marking structure is being notified by Govt. of India from time to time. **The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The examiner during final examination will also check** the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

### 2.4.1 PASS REGULATION

The minimum pass percentage for practical is 60% & minimum pass percentage of theory subjects is 40%. For the purposes of determining the overall result, 50% weightage is applied to the result of each semester examination.

## 2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examining body. The following marking pattern to be adopted while assessing:

| Performance Level | Evidence |
|---|---|
| (a) Weightage in the range of 60%-75% to be allotted during assessment | |
| For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices | • Demonstration of good skill in the use of hand tools, machine tools and workshop equipment.<br>• Below 70% tolerance dimension achieved while undertaking different work with those demanded by the component/job.<br>• A fairly good level of neatness and consistency in the finish.<br>• Occasional support in completing the project/job. |
| (b) Weightage in the range of 75%-90% to be allotted during assessment | |
| For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices | • Good skill levels in the use of hand tools, machine tools and workshop equipment.<br>• 70-80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.<br>• A good level of neatness and consistency in |

| | |
|---|---|
| | the finish.<br>• Little support in completing the project/job. |
| (c) Weightage in the range of more than 90% to be allotted during assessment | |
| For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship. | • High skill levels in the use of hand tools, machine tools and workshop equipment.<br>• Above 80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.<br>• A high level of neatness and consistency in the finish.<br>• Minimal or no support in completing the project. |

# 3. JOB ROLE

**Plumber, General;** lays out, assembles, installs and maintains sanitary fittings and fixtures, sewage and drainage systems, heating and sanitary systems, gas and water pipe lines etc. Receives instructions from Sanitary Engineer or Civil Engineer regarding lay out of pipes, gas or water mains, position of fixtures and fittings, etc. Examines drawings or other specifications regarding size and dimensions of area where sanitary fittings or pipe are to be fitted or laid. Marks points at places to indicate position for fixing brackets and laying pipes. Drills passage holes in walls or floor of premises and fixes necessary brackets, stands, holders etc. to keep or hold fittings and fixtures in position, using nuts, bolts, clamps etc. and tightens them with hand tools. Cuts reams, threads and bends pipes as appropriate. Ensures that pipe lines are laid properly by Pipe Fitter. Joins pipes with sockets, Tees, elbow etc. or with molten lead or lead wool. Caulks joints (operation of making joint seam tight to withstand pressure) and tests them for leaks with pneumatic or hydraulic pressure. May repair and maintain sewerage and pipe lines by replacing washers on leaky faucets, mending burst pipes, opening clogged drains, etc. May do lead burning, dressing and bossing of lead pipe and sheet lead, inlaying of wooden tanks, construction of septic tanks etc.

**Plumber, Operations;** is responsible for operation of plumbing system used in housing, commercial and institutional setups.

**Plumber, General-Installation and Repair;** Plumber (General)-II is responsible for installation and repair plumbing systems including those of advanced sanitary fixtures as per manufacturer's specifications in housing, commercial and institutional setups.

**Plumber, General Helper;** is responsible for helping Plumber (General) by carrying and handling of tools and materials required in installation, minor repair and maintenance of plumbing systems.

**Plumber, General Assistant;** is responsible for assistance in, preliminary installation and minor repair work of basic plumbing systems in domestic, commercial and institutional setups.

**Plumber, Maintenance and Servicing Assistant;** is responsible for assistance in maintenance and servicing of pipes and sanitary fixtures in housing, commercial and institutional setups.

**Plumber, Maintenance and Servicing;** is responsible for assistance in maintenance and servicing of pipes and sanitary fixtures in housing, commercial and institutional setups.

**Pipe Layer/Plumber Pipeline;** Sewer Pipe Layer lays concrete, stone ware or clay pipes to form sanitary drains and sewers. Receives instructions regarding size and type of concrete, stone ware or clay pipe to be laid. Digs or gets earth dug along marked lines using spade, picks etc. to make trenches for laying pipes. Levels and smoothens bottom of trenches to proper gradient by scooping with shovels. Receives pipes of required size lowered into trench manually or by pulley and adjusts their position by hand or crow-bar for correct levelling and vertical and horizontal alignment. Joints pipes together using appropriate couplings, joints, rings etc. and closes joints by caulking with fibre and cement to prevent leakage. Tests joints by hydraulic or pneumatic pressure after sealing. Fills trench with earth

to cover laid pipe and rams earth to avoid sinking. Is designated as PIPE LAYER WATERMAINS or WATER MAINS FITTER if engaged in laying cast iron or galvanized iron water pipe mains and in caulking their joints with lead to prevent leakage. May lay pipe lines to provide water connection to houses, sanitary sewers etc. May fix meters to stopcocks, remove defects from pipe lines and replace defective ones.

**Pipe Fitter;** lays, repairs and maintains, pipes for supply of water, gas, oil or steam in buildings, gardens, workshops, stores, ships etc., according to drawings or instructions. Examines drawings and other specifications or receives relevant instructions. Cuts passage holes for laying pipes in walls and floors. Cuts reams, threads and bends pipes according to specifications. Lays pipes in cut passage and assembles pipe sections with couplings, sockets, Tee's elbows etc. Levels position of pipes using sprit level for gravitational flow. Caulks joints, tests them for leakage with pneumatic or hydraulic pressure and secures pipe line to structure with clamps, brackets, and hangers. Fits water meters, taps etc. to pipe where necessary. Repairs and replaces leaky pipe lines, taps and joints and provides connections to overhead water tanks. Helps Plumber, General in fittings sanitary fittings to buildings. May join pipe sections and fittings.

**Plumbers and Pipe Fitters, Other;** perform number of routine and low skilled tasks such as assisting in laying pipes, making water tight joints, fitting sockets and reducers, threading pipes with taps and dies, removing leakages, etc., and are designated as Plumber Mate or Pipe Fitter Helper according to type of work done.

**Plumber (Welder)/Plumbing (Sanitary Fixtures) Fitter Assistant;** is responsible for welding activities related to plumbing works in housing, commercial and institutional setups.

**Plumber (Welder) Assistant;** is responsible for assistance in welding activities related to plumbing works in housing, commercial and institutional setups.

**Plumber (Pumps and E/M Mechanic);** is responsible for installation and repair of Pumps and E/M equipment used for different plumbing applications of housing, commercial and institutional Set ups.

**Reference NCO-2015 :**

a) 7126.0101
b) 7126.0102
c) 7126.0103
d) 7126.0104
e) 7126.0105
f) 7126.0106
g) 7126.0107
h) 7126.0201
i) 7126.9900
j) 7212.0101
k) 7212.0102
l) 7233.1301
m) 7126.0301

# 4. GENERAL INFORMATION

| | |
|---|---|
| **Name of the Trade** | PLUMBER |
| **NCO - 2015** | 7126.0101, 7126.0102, 7126.0103, 7126.0104, 7126.0105, 7126.0106, 7126.0107, 7126.0201, 7126.0301, 7126.9900, 7212.0101, 7212.0102, 7233.1301 |
| **NSQF Level** | Level-4 |
| **Duration of Craftsmen Training** | One year (Two semesters each of six months duration). |
| **Entry Qualification** | Appeared 10$^{th}$ class examination under 10+2 system of education. |
| **Unit Strength (No. Of Student)** | 20 Trainees (Max. supernumery seats: 6) |
| **Space Norms** | 80 sq. m |
| **Power Norms** | 3 KW |
| **Instructors Qualification for** | |
| **1. Plumber Trade** | Degree or Diploma in Civil / Mechanical engineering with 1 or 2 years post qualification experience respectively.<br>OR<br>NTC / NAC passed in Plumber or relevant trade with 3 years' post qualification experience.<br><br>**Desirable Qualification:**<br>Passed National Craft Instructor Training course in Plumber OR relevant trade. |
| **2. Workshop Calculation & Science** | Degree in Engineering with one year experience.<br>OR<br>Diploma in Engineering with two years experience.<br><br>**Desirable:**<br>**Craft Instructor Certificate in RoD& a course under NCVT.** |
| **3. Engineering Drawing** | Degree in Engineering with one year experience.<br>OR<br>Diploma in Engineering with two years experience.<br>OR<br>NTC/ NAC in the Draughtsman (Mechanical) with three years experience.<br><br>**Desirable:**<br>Craft Instructor Certificate in RoD& A course under NCVT. |
| **4. Employability Skill** | MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in |

| | |
|---|---|
| | Employability Skills from DGT institutes.<br>AND<br>Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above.<br>**OR**<br>**Existing Social Studies Instructors duly trained in Employability Skills from DGT institutes.** |
| **List of Tools and Equipment** | As per Annexure – I |

**Distribution of training on Hourly basis: (Indicative only)**

| Total hours /week | Trade practical | Trade theory | Work shop Cal. &Sc. | Engg. Drawing | Employability skills | Extra-curricular activity |
|---|---|---|---|---|---|---|
| 40 Hours | 25 Hours | 6 Hours | 2 Hours | 3 Hours | 2 Hours | 2 Hours |

# 5. NSQF LEVEL COMPLIANCE

NSQF level for **Plumber** trade under CTS: **Level 4.**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. professional knowledge
c. professional skill
d. core skill
e. Responsibility

The Broad Learning outcome of **Plumber** trade under CTS mostly matches with the Level descriptor at Level- 4

The NSQF level-4 descriptor is given below:

| Level | Process Required | Professional Knowledge | Professional Skill | Core Skill | Responsibility |
|---|---|---|---|---|---|
| Level 4 | Job that requires well developed skill, with clear choice of procedures in familiar context. | knowledge of facts, principles, processes and general concepts, in a field of work or study | a range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information. | Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication. | Responsibility for own work and Learning and some responsibility for other's works and learning. |

# 6. LEARNING/ ASSESSABLE OUTCOME

***Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.***

## 6.1 GENERIC LEARNINGOUTCOME

1. Recognize & comply safe working practices, environment regulation and housekeeping.

2. Understand and explain different mathematical calculation & science in the field of study including basic electrical. *[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine]*

3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Estimation of material, Electrical & electronic symbol]*

4. Select and ascertain measuring instrument and measure dimension of components and record data.

5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.

6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.

7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.

8. Plan and organize the work related to the occupation.

## 6.2 SPECIFIC LEARNING OUTCOME

**Semester – I**

9. Plan and organize the work to make job as per specification applying different types of basic fitting operation and Check for dimensional accuracy. *[Basic fitting operation – marking, Hacksawing, Chiseling, Filing, Drilling, Taping and Grinding etc. Accuracy: ± 0.25mm]*
10. Inner & Outer Thread cutting on Metal & Studs and thread cutting on different types of pipes & fittings accessories.

11. Join wood with carpenter's tools
12. Cutting Pipes of Different Dia in different angle and Joining of pipes by gas welding, Soldering and Brazing.
13. Make a Masonry brick wall and RCC casting. Brick wall cutting for concealing pipe line.
14. Cutting and Bending of Pipes using Plumber's tools and equipments.
15. Join various type of PVC pipe by heat process or Welding.
16. Make complete pipe line circuit with different types of Joints and fixing Cocks & valve on Pipe line.
17. Cutting of Different Types of PVC Pipe, joining and laying.
18. Perform Water analysis test, Water Pressure test and Water distribution system by using Pipe line.

**Semester – II**

19. Aligning and laying of humed asbestos pipe line of different dia and fitting & maintenance of drainage pipe line.
20. Installation and maintenance of Electric different pump.
21. Join fittings for different purposes on PVC pipe line.
22. Construction of inspection chamber, manhole, gutter, septic tank, socket etc.
23. Testing for pipe line as per site drainage pipe line layout.
24. Removal of leakage pipe line.
25. Installation, fixing & maintenance of different valve & cock.
26. Installation & maintenance of water metre and water supply for fixture.
27. Method of bending for different materials & different pipe joint.
28. Fitting and maintenance of Fixture at different place..
29. Fitting, fixing & laying installation of hot & cold water pipe line and symboling.
30. Repairing & reconditioning of waste pipe line.
31. Repairing & reconditioning, scraping & painting of sanitary fittings pipe line.

# 7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

| GENERIC LEARNING/ ASSESSABLE OUTCOME | |
|---|---|
| **LEARNING/ ASSESSABLE OUTCOME** | **ASSESSMENT CRITERIA** |
| 1. Recognize & comply safe working practices, environment regulation and housekeeping. | 1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements. |
| | 1.2 Recognize and report all unsafe situations according to site policy. |
| | 1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures. |
| | 1.4 Identify, handle and store / dispose off dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements. |
| | 1.5 Identify and observe site policies and procedures in regard to illness or accident. |
| | 1.6 Identify safety alarms accurately. |
| | 1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injuryprocedures. |
| | 1.8 Identify and observe site evacuation procedures according to site policy. |
| | 1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment. |
| | 1.10 Identify basic first aid and use them under different circumstances. |
| | 1.11 Identify different fire extinguisher and use the same as per requirement. |
| | 1.12 Identify environmental pollution & contribute to avoidance of same. |
| | 1.13 Take opportunities to use energy and materials in an environmentally friendly manner |
| | 1.14 Avoid waste and dispose waste as per procedure |
| | 1.15 Recognize different components of 5S and apply the same in the working environment. |
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| 2. Understand, explain different mathematical calculation & science in the field of study including basic electrical and apply in day to day | 2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment. |
| | 2.2 Measure dimensions as per drawing |

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| work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine,]* | 2.3 | Use scale/ tapes to measure for fitting to specification. |
| | 2.4 | Comply given tolerance. |
| | 2.5 | Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials. |
| | 2.6 | Ensure dimensional accuracy of assembly by using different instruments/gauges. |
| | 2.7 | Explain basic electricity, insulation &earthing. |
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| 3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Estimation of material, Electrical & electronic symbol]* | 3.1 | Read & interpret the information on drawings and apply in executing practical work. |
| | 3.2 | Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters. |
| | 3.3 | Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work. |
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| 4. Select and ascertain measuring instrument and measure dimension of components and record data. | 4.1 | Select appropriate measuring instruments such as micrometers, verniercalipers, dial gauge, bevel protector and height gauge (as per tool list). |
| | 4.2 | Ascertain the functionality & correctness of the instrument. |
| | 4.3 | Measure dimension of the components & record data to analyse the with given drawing/measurement. |
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| 5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality. | 5.1 | Explain the concept of productivity and quality tools and apply during execution of job. |
| | 5.2 | Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws. |
| | 5.3 | Knows benefits guaranteed under various acts |
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| 6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources. | 6.1 | Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution. |
| | 6.2 | Dispose waste following standard procedure. |
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| 7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth. | 7.1 | Explain personnel finance and entrepreneurship. |
| | 7.2 | Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme. |
| | 7.3 | Prepare Project report to become an entrepreneur for submission to financial institutions. |
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| 8. Plan and organize the work related to the occupation. | 8.1 | Use documents, drawings and recognize hazards in the work site. |
| | 8.2 | Plan workplace/ assembly location with due consideration to operational stipulation |
| | 8.3 | Communicate effectively with others and plan project tasks |
| | 8.4 | Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same. |
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| SPECIFIC LEARNING/ ASSESSABLE OUTCOME | |
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| **LEARNING/ ASSESSABLE OUTCOME** | **ASSESSMENT CRITERIA** |
| **Semester-I** | |
| 9. Plan and organize the work to make job as per specification applying different types of basic fitting operation and Check for dimensional accuracy. *[Basic fitting operation – marking, Hacksawing, Chiseling, Filing, Drilling, Taping and Grinding etc. Accuracy: ± 0.25mm]* | 9.1 Plan & Identify tools, instruments and equipments for marking and make this available for use in a timely manner. |
| | 9.2 Select raw material and inspect visually for defects. |
| | 9.3 Mark as per specification applying desired mathematical calculation and observing standard procedure. |
| | 9.4 Measure all dimensions in accordance with standard specifications and tolerances. |
| | 9.5 Identify Hand Tools for different fitting operations and make these available for use in a timely manner. |
| | 9.6 Prepare the job for Hack sawing, chiselling, filing, drilling, tapping, grinding. |
| | 9.7 Perform basic fitting operations viz., Hack sawing, filing, drilling, tapping and grinding to close tolerance as per specification to make the job. |
| | 9.8 Observe safety procedure during above operation as per standard norms and company guidelines. |
| | 9.9 Check for dimensional accuracy as per standard procedure. |
| | 9.10 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal. |
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| 10. Inner & Outer Thread cutting on Metal & Studs and then thread cutting on different types of pipes & fittings accessories. | 10.1 Identify Hand Tools for Plumber work. |
| | 10.2 Identify Hand Tools for Cutting Inner thread and Outer thread. |
| | 10.3 Identify the pipe fittings. |
| | 10.4 Perform Inner thread cutting as per drawing . |
| | 10.5 Perform Outer thread cutting as per drawing . |
| | 10.6 Prepare the Pipe line circuit with fittings as per drawing. |
| | 10.7 Observe safety procedure during thread cutting as per standard norms and company guidelines. |
| | 10.8 Check and verify the job as per drawing. |
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| 11. Join wood with carpenter's tools | 11.1 Identify the woods and character. |
| | 11.2 Identify the Carpenter's hand Tools. |
| | 11.3 Prepare the job as per drawing. |
| | 11.4 Observe safety procedure during wood cutting, sawing, chiselling, planning as per standard norms and company guidelines. |
| | 11.5 Check and verify the job as per drawing. |

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| 12. Cutting Pipes of Different Dia in different angle and Joining of pipes by gas welding, Soldering and Brazing . | 12.1 Identify different components/parts of Gas (oxy-acetylene) machine, collect desired information and set each components/parts as per standard procedure. |
| | 12.2 Observe safety/ precaution during operation. |
| | 12.3 Select appropriate material & plan for gas cutting & joining operation. |
| | 12.4 Cut & join metal parts / mechanical components as per specification observing standard procedure. |
| | 12.5 Check cut portion/ joined part to ascertain proper welding. |
| | 12.6 Identify hand tools for Soldering and Brazing. |
| | 12.7 Mark and develop various forms as per drawing using sheet metals. |
| | 12.8 Make of simple items with sheet metal as per drawing. |
| | 12.9 Perform Soldering and Brazing. |
| | 12.10 Observe safety procedure during operation |
| | 12.11 Check and verify the job as per drawing. |
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| 13. Make a Masonry brick wall and RCC casting. Brick wall cutting for concealing pipe line. | 13.1 Identify different types of Mason's hand tools. |
| | 13.2 Identify the Construction materials. |
| | 13.3 Make a simple construction of different type of Brick joints with mortar. |
| | 13.4 Prepare a job Masonry work and RCC casting as per drawing. |
| | 13.5 Check & verify the job as per drawing. |
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| 14. Cutting and Bending of Pipes using Plumber's tools and equipments. | 14.1 Identify different types of Plumber's hand tools. |
| | 14.2 Demonstrate care of hand tools. |
| | 14.3 Cutting the pipe with Pipe cutter. |
| | 14.4 Demonstrate working of Bending Machine and accessories. |
| | 14.5 Make desired bend on pipe as per drawing. |
| | 14.6 Check the job as per Drawing. |
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| 15. Various type of PVC pipe joint by heat process or Welding. | 15.1 Identify different types of PVC Pipe. |
| | 15.2 Demonstrate working of Electric Welding Machine and accessories for PVC pipes |
| | 15.3 Simple joint of PVC pipe by Welding Machine. |
| | 15.4 Making a job with PVC fittings and pipe as per drawing. |
| | 15.5 Observe safety procedure during operation. |
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| 16. Make complete pipe line circuit with different types of Joints and fixing Cocks & valve on Pipe line. | 16.1 Identify different types of Joints. |
| | 16.2 Identify different types of tools different types of Joints. |
| | 16.3 Make a Flange joint as per drawing. |
| | 16.4 Make a Detachable joint as per drawing. |
| | 16.5 Make a Spigot & Socket joint as per drawing. |
| | 16.6 Make a Socket joint as per drawing. |

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| | 16.7 | Identify GI fittings. |
| | 16.8 | Identify Cocks & Valves. |
| | 16.9 | Identify Tools for Fixing of fittings with GI pipe, Cocks & Valves. |
| | 16.10 | Make a simple job on GI Pipe with fittings, Cocks, and Valves as per drawing. |
| | 16.11 | Check & verify the job as per drawing. |
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| 17. Cutting of Different Types of PVC Pipe, joining and laying. | 17.1 | Identify Tools and materials for Cutting & Joining of PVC pipes. |
| | 17.2 | Make a job of Pipe line Circuit as per drawing. |
| | 17.3 | Check & verify the job as per drawing. |
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| 18. Perform water analysis test, Water Pressure test and Water distribution system by using Pipe line. | 18.1 | Prepare water for test. |
| | 18.2 | Preparation of water analysis kits. |
| | 18.3 | Test water for pH, TDS, Temperature as per requirements. |
| | 18.4 | Preparation of Hydraulic Pressure Test Machine. |
| | 18.5 | Pressure test on Cistern and Tank. |
| | 18.6 | Check and verify test result . |
| **Semester- II** | | |
| 19. Aligning and laying of humed asbestos pipe line of different dia and fitting & maintenance of drainage pipe line . | 19.1 | Plan and identify tools, instrument and equipments for marking and make this available for use on a timed manner. |
| | 19.2 | Select of raw materials and visually inspect for defects. |
| | 19.3 | Check the defect of humed and asbestos pipe line. |
| | 19.4 | Prepare the job, tools & raw materials. |
| | 19.5 | Observe safety procedure for desired operation as per standard norms and company guidelines. |
| | 19.6 | Check for dimensional accuracy as per standard procedure. |
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| 20. Installation and maintenance of different Electric pump. | 20.1 | Select the pump and inspect for defects. |
| | 20.2 | Select the tools, instrument and equipment for the pump instalment and repairing. |
| | 20.3 | Check and calculate output of the pumps. |
| | 20.4 | Install pump Observing standard procedure and method as per specification using appropriate tools and raw material. |
| | 20.5 | Check performance of the pump. |
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| 21. Join fittings for different purposes on PVC pipe line. | 21.1 | Identify tools, instrument and equipments for marking and make this available for use in a timely manner. |
| | 21.2 | Mark as per specification applying desired mathematical calculation and observing standard procedure. |
| | 21.3 | Join fittings for desired purpose on PVC pipe line. |
| | 21.4 | Measure all dimensions in accordance with the drawing. |

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| | 21.5 | Observe safety procedure during desired operation as per standard norms. |
| | 21.6 | Check for dimensional accuracy as per standard procedure. |
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| 22. Construction of inspection chamber, manhole, gutter, septic tank, socket etc. | 22.1 | Plan and identify tools and equipment for desired purpose and make this available for use in a timely manner. |
| | 22.2 | Select raw materials and inspect for defect. |
| | 22.3 | Mark as per drawing applying desired mathematical calculation and observing standard procedure. |
| | 22.4 | Construct inspection chamber, manhole, gutter, septic tank, socket etc. as per drawing. |
| | 22.5 | Measure all dimensions in accordance with standard specification and tolerance. |
| | 22.6 | Observe safety procedure during desired operation as per standard norms. |
| | 22.7 | Check for dimensional accuracy as per standard procedure. |
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| 23. Testing for pipe line as per site drainage pipe line layout. | 23.1 | Identify tools and equipment for testing pipe line. |
| | 23.2 | Prepare the job for different testing for pipe line. |
| | 23.3 | Test pipe line observing standard procedure. |
| | 23.4 | Observe safety precaution during operation. |
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| 24. Removal of leakage pipe line. | 24.1 | Identify the leakage pipe. |
| | 24.2 | Remove out pipe leakages as per standard procedure. |
| | 24.3 | Observe safety procedure during desired operation as per standard norms. |
| | 24.4 | Check performance after removal of leakages. |
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| 25. Installation, fixing & maintenance of different valve & cock. | 25.1 | Plan and identify tools, instrument & equipments for Installation, fixing & maintenance of different valve & cock and make this available for use in a timely manner. |
| | 25.2 | Select valve and cock, inspect for defects. |
| | 25.3 | Install desired Valve & Cock observing standard procedure. |
| | 25.4 | Identify the problem with valve & cock fitted and solved the problem. |
| | 25.5 | Observe safety procedure during the operation as per standard norms. |
| | 25.6 | Check different parameters and functionality of the system. |
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| 26. Installation & maintenance of water metre and water supply | 26. 1. | Plan and identify tools, instrument & equipments for Installation, fixing & maintenance of different water metre and water supply for fixture and make this |

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| | for fixture. | available for use in a timely manner. |
| | | 26. 2. Select water metre and water supply for fixture, inspect for defects. |
| | | 26. 3. Install desired water metre and water supply for fixture observing standard procedure. |
| | | 26. 4. Identify the problem with water metre and water supply for fixture fitted and solved the problem. |
| | | 26. 5. Observe safety procedure during the operation as per standard norms. |
| | | 26. 6. Check different parameters and functionality of the system. |
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| 27. | Method of bending for different materials & different pipe joint. | 27.1 Plan and identify tools, instrument & equipments for marking and make this available for use in a timely manner. |
| | | 27.2 Select desired material and machine and inspect for defects. |
| | | 27.3 Bend G.I. pipe as per drawing and measurement. |
| | | 27.4 Bend PVC pipe of different diameter in different angle. |
| | | 27.5 Observe safety procedure during desired operation as per standard norms and schedule drawing. |
| | | 27.6 Check for dimensional accuracy as per drawing. |
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| 28. | Fitting and maintenance of Fixture at different place. | 28.1 Plan and identify tools, instrument & equipments for marking and make this available for use in a timely manner. |
| | | 28.2 Select raw material and inspect for defects. |
| | | 28.3 Cut & join C.I. pipe for waste pipe line in accordance with standard specification and drawing. |
| | | 28.4 Fix external soil pipe as per drawing observing standard procedure. |
| | | 28.5 Fix rain water gutter outlet and ground pipe as per standard norms and schedule drawing. |
| | | 28.6 Check different parameters and functionality of the system. |
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| 29. | Fitting, fixing & laying installation of hot & cold water pipe line and symboling. | 29.1 Plan and identify tools, instrument & equipments for desired work and make this available for use in a timely manner. |
| | | 29.2 Install pipe line for distribution of hot & cold water according to drawing. |
| | | 29.3 Install hot water system & solar water heating system in accordance with standard specification and drawing. |
| | | 29.4 Observe safety procedure during desired operation as per standard norms and schedule drawing. |
| | | 29.5 Check different parameters and functionality of the system. |

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| 30. Repairing & reconditioning of waste pipe line. | 30.1 Plan and identify tools, instrument & equipments for desired work and make this available for use in a timely manner. |
| | 30.2 Perform fitting of different trap, valve, cistern etc. |
| | 30.3 Construct over head tank as per drawing and measurement. |
| | 30.4 Perform pressure test by hydraulic test machine. |
| | 30.5 Observe safety procedure during desired operation as per standard norms and schedule drawing. |
| | 30.6 Check different parameters and functionality of the system. |
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| 31. Repairing & reconditioning, scraping & painting of sanitary fittings pipe line. | 31.1 Plan and identify tools, instrument & equipments for desired work and make this available for use in a timely manner. |
| | 31.2 Perform cleaning of sanitary pipe line and remove corrosion from pipe line. |
| | 31.3 Remove corrosion from pipe line and Perform scraping & painting of pipe line in accordance with standard guidelines. |
| | 31.4 Replace broken or cracked sanitary fitting. |
| | 31.5 Observe safety procedure during desired operation as per standard norms and schedule drawing. |
| | 31.6 Check different parameters and functionality of the system. |
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# 8. SYLLABUS

| SYLLABUS - PLUMBER | | | |
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| **FIRST SEMESTER – 06 Months** | | | |
| **Week No.** | **Reference Learning Outcome** | **Professional Skills (Trade Practical) with Indicative Hours** | **Professional Knowledge (Trade Theory)** |
| 1. | Recognize & comply safe working practices, environment regulation and housekeeping. | 1. Importance of trade training, List of tools & Machinery used in the trade. (1 hr)<br>2. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). (5 hrs)<br>3. First Aid Method and basic training. (2 hrs)<br>4. Safe disposal of waste materials like cotton waste, metal chips/burrs etc. (2 hrs)<br>5. Hazard identification and avoidance. (2 hrs)<br>6. Safety signs for Danger, Warning, caution & personal safety message. (1 hr)<br>7. Preventive measures for electrical accidents & steps to be taken in such accidents. (2 hrs)<br>8. Use of Fire extinguishers. (7 hrs)<br>9. Practice and understand precautions to be followed while working in the trade. (2 hrs)<br>10. Safe use of tools and equipments used in the trade. (1 hr) | • Importance of safety and general precautions required for the trade.<br>• Importance of the trade.<br>• Types of work to be done by trainees in the institute.<br>• Scope of a plumbing work.<br>• Types of services has to plan.<br>• Basic Bench fitting |

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| 2-3 | Plan and organize the work to make job as per specification applying different types of basic fitting operation and Check for dimensional accuracy. *[Basic fitting operation – marking, Hacksawing, Chiseling, Filing, Drilling, Taping, Threading and Grinding etc. Accuracy: ± 0.25mm]* | 11. Use Steel rule and Steel Tape for measuring, Use Scriber and Divider for marking on raw materials. (10 hrs)<br>12. Demonstrate use of different types of Vice: - Bench vice, Pipe vice, Chain Vice, Hand vice, Chain Wrench. (20 hrs)<br>13. Demonstrate use of various Hand Tools: - Different Files, Hammer, Centre Punch, Hacksaw, Chisel, Callipers, Pipe Wrench, Stock & Dies, Taps and Holders. (20 hrs) | • Plumber's common hand tools - names, description and material from which they are made.<br>• Description, types and uses of holding device , hammers & cold chisels, cutting tools. |
| 4-6 | -do- | 14. Inspect raw material for rusting, scaling, corrosion etc. (2 hrs)<br>15. Mark out lines, gripping suitably in vice jaws, hacksawing to given dimensions. (5 hrs)<br>16. Sawing different types of metals of different sections. (5 hrs)<br>17. Filing- Flat and square (Rough finish). (3 hrs)<br>18. Filing practice, surface filing, marking of straight and parallel lines with odd leg callipers and steel rule. (2 hrs)<br>19. Marking with dividers, odd leg callipers and steel rule (circles, ARCs, parallel lines). (5 hrs)<br>20. Marking off straight lines and ARCs using scribing block and dividers. (5 hrs)<br>21. Chipping flat surfaces along a marked line with hammer. (5 hrs) | • Description of simple fitting operations hack sawing, punching and filing.<br>• Types of files used commonly.<br>• Marking instruments and their use of simple drilling machine.<br>• Method of using drills.<br>• Description of simple bench drilling Machine.<br>• Description of Grinding and Chisel.<br>• Description of different types of locking and fastening devices. |

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| | | 22. Grinding of Chisel. (5 hrs)<br>23. Marking, filing, filing square and check using tri-square. (10 hrs)<br>24. Marking according to simple blue prints for locating, position of holes, scribing lines on chalked surfaces with marking tools. (10 hrs)<br>25. Finding centre of round bar with the help of 'V' block and marking block. (3 hrs)<br>26. Joining straight line to an ARC. (10 hrs)<br>27. Punch letter and number (letter punch and number punch) (1 hr)<br>28. Mark off, punch marking lines and drill through holes on M.S. flat. (4 hrs) | |
| 7 | Inner & Outer Thread cutting on Metal & Studs and thread cutting on different types of pipes & fittings accessories. | 29. Thread Inner on M.S. flat by using Tap. (5 hrs)<br>30. Outer thread on Studs by using Die. (5 hrs)<br>31. Use various locking device. (5 hrs)<br>32. Inner thread on Pipes by using Tap. (5 hrs)<br>33. Outer thread on Pipe by using Die. (3 hrs)<br>34. Fixing of different Pipe fittings in different position of Pipe. (2 hrs) | • About different types of pipes-GI, CI, DI, PVC/ CPVC, PPR, AC and HDPE etc.<br>• About different Types of Pipe Fittings: - Socket, Elbow, Tee, Union, Bend, Cap, Plug, Cross, Ferrule etc.<br>• About different types of Thread cutting. |

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| 8 -9 | Join wood with carpenter's tools | 35. Cutting wood by Sawing as per marking. (10 hrs)<br>36. Use of Jack Plane for planning the job. (10 hrs)<br>37. Use marking gauge for marking on job. (10 hrs)<br>38. Make groove on wood by Firmer/ appropriate Chisel as per drawing and measurements. (10 hrs)<br>39. Make a "T" joints as per drawing. ( 5 hrs)<br>40. Make a Cross joints as per drawing. ( 5 hrs) | **Carpenter works :-**<br>• Description and uses of Carpenter's hand tools used for simple operations such as marking, sawing, planning and making simple joints.<br>• Common types of wood- their description and use. |
| 10- 12 | Cutting Pipes of Different Dia in different angle and Joining of pipes by gas welding, Soldering and Brazing. | 41. Cutting different diameter of MS pipes in different angles. (15 hrs)<br>42. Joining of Pipe in same dia by gas welding. (10 hrs)<br>43. Joining of Pipes in different dia by gas welding. (10 hrs)<br>44. Joining of Pipes 90 degree, 45 degree and 22.50 degree angle. (10 hrs)<br>45. Joining of pipes for 90 degree bend by gas welding (5 hrs)<br>46. Do some repair work by welding. ( 10 hrs)<br>47. Join sheet by soldering. ( 5hrs)<br>48. Brazing on Sheet. (5 hrs)<br>49. Make a job by Soldering and Brazing. (5 hrs) | **Gas Welding :-**<br>• Purpose of Gas welding.<br>• Method of gas welding,<br>• Safety precautions to be observed -Methods of soldering and brazing - fluxes used & Types of fluxes precautions to be observed.<br>• Hard & soft solders -their properties, composition and uses. |
| 13-14 | Make a Masonry brick wall and RCC casting. Brick wall cutting for concealing pipe line. | 50. Demonstrate proper handling of Mason's hand tools :- Straight edge, Spirit level, Plumb bob, Square, Trowel etc. (5 hrs)<br>51. Setting out work with Tape, Rule, Square, Line pin and level as per drawing. (5 hrs)<br>52. Cutting Bricks and Stone to given size and template by | **Mason's works :-**<br>• Names and description of Mason's hand tools and their uses.<br>• Method of making holes in walls and floors.<br>• Types of tools used and various Processes.<br>• Concept of bricks, lime and cement.<br>• Preparation of mortars with |

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| | | cutting tools. (5 hrs)<br>53. Prepare Cement mortars in different proportions to suit various purposes. (5 hrs)<br>54. Construct various Types of Brick wall. (5 hrs)<br>55. Prepare Plane Cement Concrete and RCC in different proportions to suit various purposes. (5 hrs)<br>56. RCC casting various sizes of plate. (5 hrs)<br>57. Benching and Channelling of base plate. ( 5 hrs)<br>58. Damp proofing. (2 hrs)<br>59. Plastering the walls. (3 hrs)<br>60. Cutting of Masonry wall for concealing with Electric Cutting Tools. (5 hrs) | various materials of varying composition.<br>• Common brick joints.<br>• Description of bonds.<br>• Scaffolding &plastering.<br>• Define Plain cement concrete, RCC and its proportion,<br>• Grades of coarse aggregate and fine aggregate,<br>• Knowledge of waterproofing compound.<br>• Knowledge of Building Plan and Cross section of wall.<br>• Identify plumbing services required for each type of building according to usage. |
| 15-17 | Cutting and Bending of Pipes using Plumber's tools and equipments. | 61. Demonstrate proper handling of Plumber's Tools & Equipments. (5 hrs)<br>62. Use and care of Plumber's Tools and Equipments. (15 hrs)<br>63. Cutting of G.I Pipes of different Diameter and Sizes by cutting tools. ( 5 hrs)<br>64. Cutting of C.I Pipe of different Diameter and Sizes by cutting tools. ( 10 hrs)<br>65. Cutting of AC Pipe of different Diameter and Sizes by cutting tools. ( 10 hrs)<br>66. Cutting of all kinds of PVC Pipe of different Diameter and Sizes by cutting tools. ( 5 hrs)<br>67. Bending of G.I Pipe as per drawing using Bending Machine up to 50 mm dia.(10 hrs)<br>68. Bending of Steel Pipe as per | • Description of plumber tools and Equipments- Ratchet brace, Threading die, Pipe wrench, Sliding wrench, Spanner set, Chain Wrench etc. and their safety.<br>• Care & use of tools.<br>• Pipes different kinds<br>• Method of Pipe bending in different dia.<br>• Plumbing Symbols and Code for Tools & Materials on water line. |

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| | | drawing using Bending Machine up to 50 mm dia. (10 hrs)<br>69. Bending of PVC Pipe as per drawing using heat process up to 50 mm dia. (5 hrs) | |
| 18 | Join Various type of PVC pipe by heat process or Welding. | 70. Preparation of PVC pipe & Fittings in different dia. (1 hr)<br>71. Preparation and precaution of Electric Hot Plate. (1 hr)<br>72. PVC Pipe welding various dia, using welding machine. (13 hrs)<br>73. Weld various type of PVC Pipe with various dia, using welding machine. (5 hrs)<br>74. PPR pipe welding joint various dia of pipe using welding machine. (5 hrs) | • Equipments and tools for hot gas welding and electric hot plate for PPR pipe joints. |
| 19 | Make complete pipe line circuit with different types of Joints and fixing Cocks & valve on Pipe line. | 75. CI/HCI Pipe Flange joint with Bend and Tee.(5 hrs)<br>76. Socket joint of CI Pipes with lead. ( 5 hrs)<br>77. Detachable joint of AC pressure Pipe. (5 hrs)<br>78. Titan/Socket & Spigot joint of Ductile Iron (DI) Pipe with Rubber ring.(4 hrs)<br>79. Prepare and Study the drawing of Pipe line circuit and schedule use of Tools and accessories. (2 hrs)<br>80. Make a Pipe line circuit on GI Pipe with Socket, Elbow, Bend, Flange, Tee, Union etc. And Fixing Cocks & Valves as per drawing. (4 hrs) | • Types of fittings for different joints & different pipes.:- CI,HCI,AC,AC Pressure, DI, GI Pipes. Joints:- Flange joint, Socket joint with lead, Detachable joint, Socket & Spigot joints etc.<br>• Description of pipe fittings.<br>• Methods of joining and their uses.<br>• Precautions to be taken while fixing |
| 20 | Cutting of Different Types of PVC Pipe, joining and laying. | 81. PVC pipe cutting & shaping in various dia, using Hacksaw and Pipe cutters. (10 hrs)<br>82. Preparation of PVC pipe and Fittings with emery paper.(5 | • Different kinds of Joints, Fittings and Materials in joining pipes :- PVC/CPVC, PPR and HDPE etc. |

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| | | hrs)<br>83. Use & fixing of PVC fittings use Solvent Cement etc. (5 hrs)<br>84. Layout of PVC pipe according to drawing. (5 hrs) | |
| 21 | Perform Water analysis test, Water Pressure test and Water distribution system by using Pipe line. | 88. Preparation of Water and Water analysis kit. (1 hr)<br>89. Water Analysis Test by Analysis Kits. pH, TDS, Temperature etc. (4 hrs)<br>90. Preparation of Hydraulic Pressure Test Machine. (1 hr)<br>91. Static water pressure test by Hydraulic Pressure Test Machine apply on Plastic Water bottle. (4 hrs)<br>92. Static water pressure test by Hydraulic Pressure Test Machine apply on Cistern and Tank. (4 hrs)<br>93. Steps of simple pipe line connection as per drawing. (3 hrs)<br>94. Make a pipe line for water distribution as per drawing. (4 hrs)<br>95. Make a pipe line for OHR water distribution system as per drawing. (4 hrs) | **Composition of Water :-**<br>• Sources of water<br>• Hard & Soft water, temporary hardness & permanent hardness.<br>• Impurities of water – organic and inorganic impurities.<br>• Water purification stages and methods.<br>• Static water pressures and measurement of pressures. Bursting pressure,<br>• Expansion of water on freezing and heating.<br>• Bernoulli's principles<br>• Pascal's law.<br>• Pressure of water on the sides of cistern or tank.<br>• Water hammer in pipes. |
| 22-23 | **In-plant training/ Project work**<br>Broad Areas:<br>a) Pipe Fixture.<br>b) Layout of water Pipe line.<br>c) Fixing Cocks and Valve.<br>d) Supply & distribution of water. | | |
| 24 | **Revision** | | |
| 25-26 | **Examination** | | |

***Note: -***

1. *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of industry on machine fitting, alignment of pump-*

*motor, fitting of pipes & tubes, assembling jobs, maintenance work, etc.,may be shown to the trainees to give a feel of Industry and their future assignment.*

2. *Some of the sample project works (indicative only) are given against each semester.*
3. *Instructor may design their own project and also inputs from local industry may be taken for designing such new project.*
4. *The project should broadly cover maximum skills in the particular trade and must involve some problem solving skill. Emphasis should be on Teamwork: Knowing the power of synergy/ collaboration, work to be assigned in a group (Group of at least 4 trainees). The group should demonstrate Planning, Execution, Contribution and Application of Learning. They need to submit Project report.*
5. *If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce components/ sub-assemblies in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.*

| SYLLABUS - PLUMBER | | | |
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| **SECOND SEMESTER – 06 Months** | | | |
| **Week No.** | **Reference Learning Outcome** | **Professional Skills (Trade Practical) with Indicative Hours** | **Professional Knowledge (Trade Theory)** |
| 27 | Aligning and laying of humed asbestos pipe line of different dia and fitting & maintenance of drainage pipe line. | 96. Interpret drawing of sanitary plumbing. (05 hrs)<br>97. Lay & align pipe. (08 hrs)<br>98. Lay & align humed and asbestos pipe. (08 hrs)<br>99. Demonstrate use of specific dia in different location. (04 hrs) | • Use of hummed and asbestos pipes of different sizes.<br>• Method of laying out pipes alignment and joining. |
| 28 | - Do - | 100. Use various sanitary fitting. (06 hrs)<br>101. Use various fitting of different materials. (06 hrs)<br>102. Use joining materials of pipe. (07 hrs)<br>103. Join pipe as per laid down Procedure. (06 hrs) | • Description of various pipe joints- straight, Branch , Taft and blow, Expansion joints. Solders and fluxes used in joints. |
| 29-31 | Installation and maintenance of different Electric pump. | 104. Demonstrate use of different pump. (10 hrs)<br>105. Demonstrate installation of electric pump (20 hrs)<br>106. Demonstrate maintenance of electric pump. (10 hrs)<br>107. Demonstrate working process of centrifugal, reciprocating, submersible pump. (15 hrs)<br>108. Demonstrate delivery of water to over head tank through pump, presser head, delivery pipe, suction pipe, etc, (15 hrs)<br>109. Contamination of water in a well. (05 hrs) | • Description of Plumber's materials Lead, tin, Zinc, solder, copper, red lead etc. and their uses.<br>• Water supply system of a small town.<br>• Description and types of pumps viz. suction pump, Centrifugal pump etc. Contamination of water in a well. |
| 32-33 | Join fittings for different purposes on PVC pipe line. | 110. Produce metric & BSP thread on pipe. (10 hrs)<br>111. Produce Internal and external thread on PVC pipes of different dia. (10 hrs)<br>112. Join PVC pipe with thread. (06 hrs)<br>113. Join PVC pipe with solvent cement and heat process(10 | • Description of pipe dies, their uses, care and precaution.<br>• Metric specification of various pipes.<br>• Standard pipe threads.<br>• Method employed for bending, Joining and fixing PVC pipe. |

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| | | hrs)<br>114. Join PVC pipe as per layout. (14 hrs) | • Joining material for water and gas pipes.<br>• Use of blow lamp. |
| 34 | Construction of inspection chamber, manhole, gutter, septic tank, socket etc. | 115. Demonstrate inspection chamber, manhole, gully trap, septic tank, soak pit. (04 hrs)<br>116. Construct inspection chambers, cesspool, septic tank, soak pit etc. (21 hrs) | • Inspection chamber, septic tank, description of drains, cess pools, soak pits etc.<br>• Types of traps<br>• layout of drainage system |
| 35 | Testing for pipe line as per site drainage pipe line layout. | 117. Demonstrate drawing layout of drainage pipe line. (06 hrs)<br>118. Perform testing for smoke test, water test, smell test, ball test mirror test. (10 hrs)<br>119. Join heavy cast iron socket pipe. (03 hrs)<br>120. Sealing of heavy cast iron pipe joint with lead & caulking tools. (06 hrs) | • Method of bending pipes by hot and cold process.<br>• Method of testing drainage lines |
| 36 | Removal of leakage pipe line. | 121. Identify location of leakage pipe. (06 hrs)<br>122. Removing out leakages pipe. (10 hrs)<br>123. Removing of air locks (06 hrs)<br>124. Demonstrate rain water harvesting system. (03 hrs) | • Method of dismantling and renewal of the valves and pipes. Leaks in pipes and noises in plumbing.<br>• Installation of water meters. Air lock in pipes and its removal. |
| 37 | Installation, fixing & maintenance of different valve & cock. | 125. Demonstrate different cocks & valves including materials. (04 hrs)<br>126. Employ cocks & valves at different place. (06 hrs)<br>127. Employ different cock & valve with sensor system. (06 hrs)<br>128. Demonstrate maintenance of different cocks & valves. (06 hrs)<br>129. Demonstrate use of packing washer gasket of different cock & valve. (03 hrs) | • Description of cocks & valves-their types, materials & advantages for particular work. |
| 38-40 | Installation & maintenance of water meter and water supply for fixture. | 130. Demonstrate location of meter. Fitting of water meter, bath tub, wash basin. (10 hrs)<br>131. Install water metre, bath tub, hand wash basin, water closet urinal, sink etc with sensor system. (25 hrs)<br>132. Demonstrate maintenance of water metre, bath tub, hand | • Erecting rain water and drainage pipe system,<br>• installation of sanitary fitting s, inspection and testing of water supply system.<br>• -Pipe alignment and slope. -Prevention of water hammer. |

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| | | wash basin, water closet urinal, sink etc. (15 hrs)<br>133. Demonstrate testing of water metre, Bath Tub, Hand wash basin. (10 hrs)<br>134. Erect rain water and drainage pipe system. (15 hrs) | • Storage tanks for general water supply propose.<br>• Test for water supply pipes.<br>• Description of sanitary fittings,<br>• general points to be observed when choosing sanitary |
| 41-42 | Demonstrate bending for different materials & different pipe joint. | 96. Demonstrate bending of pipes in bending machine. (08 hrs)<br>97. Bend GI pipe of different diameter in different angle. (14 hrs)<br>98. Bend G.I. pipe as per drawing and measurement. (14 hrs)<br>99. Bend PVC pipe of different diameter in different angle with dry sand by heating. (14 hrs) | Method of bending galvanized and other heavy pipes. |
| 43-44 | Fitting and maintenance of Fixture at different place. | 100. Demonstrate process of C.I pipe cutting & joining. (12 hrs)<br>101. Process of C.I. pipe fitting for waste pipe line in different section. (08 hrs)<br>102. Employ Process of fixing of external soil pipe. (12 hrs)<br>103. Demonstrate process of fixing of rain water gutter outlet and ground pipe. (10 hrs)<br>104. Demonstrate process of measurement of waste pipe line. (08 hrs) | **Domestic drainage system:**<br>General layout, one pipe system, specifications of Materials required.<br>Method of testing leakage.<br>-Different types of traps, ventilation, antisyphonage and sinks.<br>About Fire hydrants and their fittings. |
| 45 | Fitting, fixing & laying installation of hot & cold water pipe line and symboling. | 105. Demonstrate working of solar water heating system. (02 hrs)<br>106. Analyse temperature of water (hot and cold). (02 hrs)<br>107. Layout pipe line for hot and cold water distribution as per drawing. (04 hrs)<br>108. Install pipe line for distribution of hot & cold water. (08 hrs)<br>109. Install hot water system & solar water heating system. (08 hrs)<br>110. Symbolise distribution of hot & cold water pipe line. (01 hr) | Concept of heat and Temperature.<br>Method of transmission of heat.<br>Heating system by different thermal units. Domestic hot and cold water. General layout, specification of materials required and Connection of pipes to mains. Tracing leakage. Repairs to service main. Domestic boilers and Geysers. Method of ventilating pipe. Precaution against air Poisoning.<br>• Fixing of solar water system. |

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| 46 | Repairing & reconditioning of waste pipe line. | 111. Perform fitting of different trap, valve, cistern etc. (03 hrs)<br>112. Demonstrate construction of over head tank as per measurement. (08 hrs)<br>113. Maintenance and recondition pipe line. (10 hrs)<br>114. Perform pressure test by hydraulic test machine. (04 hrs) | • Plumbing and sanitary symbols and plumbing codes for all tools and materials |
| 47 | Repairing & reconditioning, scraping & painting of sanitary fittings pipe line. | 115. Demonstrate cleaning of sanitary pipe line. (02 hrs)<br>116. Perform cleaning of sanitary pipe line. (04 hrs)<br>117. Remove corrosion from pipe line. (03 hrs)<br>118. Demonstrate scraping & painting. (02 hrs)<br>119. Perform scraping & painting of pipe line. (04 hrs)<br>120. Maintenance of broken or cracked sanitary fitting. (05 hrs)<br>121. Estimate and work out abstract cost of plumbing work as per drawing/layout. (05 hrs) | Sensor system for urinals and was basin, etc.<br>Corrosion - causes and remedies, prevention.<br>Corrosion due to electrolytic action.<br>Effect of water and frost on materials.<br>Layout of pipes as per drawing.<br>Analysis quantity measurement and abstract rate of plumbing and sanitary work.<br>**Bill of Quantity and Estimation :-**<br>• Preparation of bill of quantity<br>• Preparation of Estimation |
| 48-49 | **In plant training/ Project work**<br>Broad areas:<br>1. Laying, alignment & joining of different material and diameters with various fitting drainage & sewers pipe line.<br>2. Installation of different electric pump.<br>3. Installation of plumbing/ sanitary fixture (Basin, Water closet urinal, sink etc) with sensor.<br>4. Installation of hot and cold water pipe line.<br>5. Estimate & abstract cost of plumbing work. | | |
| 50 | **Revision** | | |
| 51-52 | **Examination** | | |

***Note: -***

1. *Some of the sample project works (indicative only) are given against each semester.*
2. *Instructor may design their own project and also inputs from local industry may be taken for designing such new project.*
3. *The project should broadly cover maximum skills in the particular trade and must involve some problem solving skill. Emphasis should be on Teamwork: Knowing the power of synergy/ collaboration, work to be assigned in a group (Group of at least 4*

*trainees). The group should demonstrate Planning, Execution, Contribution and Application of Learning. They need to submit Project report.*

4. *If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce components/ sub-assemblies in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.*

# 9. SYLLABUS - CORE SKILLS

## 9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

| First Semester<br>Duration: Six Month | | |
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| **S No.** | **Workshop Calculation and Science** | **Engineering Drawing** |
| 1. | **Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units | Engineering Drawing: Introduction and its importance<br>- Relationship to other technical drawing types<br>- Conventions<br>- Viewing of engineering drawing sheets.<br>- Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 |
| 2. | **Fractions** : Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator. | Drawing Instruments : their Standard and uses<br>- Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips. |
| 3. | **Square Root** : Square and Square Root, method of finding out square roots, Simple problem using calculator. | Lines :<br>- Definition, types and applications in Drawing as per BIS SP:46-2003<br>- Classification of lines (Hidden, centre, construction, Extension, Dimension, Section)<br>- Drawing lines of given length (Straight, curved)<br>- Drawing of parallel lines, perpendicular line<br>- Methods of Division of line segment |
| 4. | **Ratio &Proportion** : Simple calculation on related problems. | Drawing of Geometrical Figures: Definition, nomenclature and practice of<br>- Angle: Measurement and its types, method of bisecting.<br>- Triangle -different types<br>- Rectangle, Square, Rhombus, Parallelogram.<br>- Circle and its elements. |

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| 5. | **Percentage** : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa. | Lettering and Numbering as per BIS SP46-2003:<br>- Single Stroke, Double Stroke, inclined, Upper case and Lower case. |
| 6. | **Material Science** : properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys. | Dimensioning:<br>- Definition, types and methods of dimensioning (functional, non-functional and auxiliary)<br>- Types of arrowhead<br>- Leader Line with text |
| 7. | **Mass, Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals. | Free hand drawing of<br>- Lines, polygons, ellipse, etc.<br>- geometrical figures and blocks with dimension<br>- Transferring measurement from the given object to the free hand sketches. |
| 8. | **Speed and Velocity**: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems. | Sizes and Layout of Drawing Sheets<br>- Basic principle of Sheet Size<br>- Designation of sizes<br>- Selection of sizes<br>- Title Block, its position and content<br>- Borders and Frames (Orientation marks and graduations)<br>- Grid Reference<br>- Item Reference on Drawing Sheet (Item List) |
| 9. | **Work, Power and Energy**: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy. | Method of presentation of Engineering Drawing<br>- Pictorial View<br>- Orthogonal View<br>- Isometric view |
| 10. | ----- | Symbolic Representation (as per BIS SP:46-2003) of :<br>- Fastener (Rivets, Bolts and Nuts)<br>- Bars and profile sections<br>- Weld, brazed and soldered joints.<br>- Electrical and electronics element<br>- Piping joints and fittings |

| Second Semester<br>Duration: Six Month | | |
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| **S No.** | **Workshop Calculation and Science** | **Engineering Drawing** |
| 1. | **Algebra** : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables). | Construction of Scales and diagonal scale |
| 2. | **Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle,<br><br>Volume of solids – cube, cuboids, cylinder and Sphere.<br><br>Surface area of solids – cube, cuboids, cylinder and Sphere. | Practice of Lettering and Title Block |
| 3. | **Trigonometry:** Trigonometrical ratios, measurement of angles.<br><br>Trigonometric tables | Dimensioning practice:<br><br>- Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003)<br>- Symbols preceding the value of dimension and dimensional tolerance.<br>- Text of dimension of repeated features, equidistance elements, circumferential objects. |
| 4. | **Heat & Temperature**: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation. | Construction of Geometrical Drawing Figures:<br><br>- Different Polygons and their values of included angles. Inscribed and Circumscribed polygons.<br>- Conic Sections (Ellipse& Parabola) |
| 5. | **Basic Electricity**: Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections – series, parallel, electric power, Horse power, energy, unit of electrical energy. | Drawing of Solid figures (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions. |
| 6. | **Levers and Simple Machines:** levers and its | Free Hand sketch of hand tools and |

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| | types.<br><br>Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage. | measuring tools used in respective trades. |
| 7. | | Projections:<br><br>- Concept of axes plane and quadrant.<br>- Orthographic projections<br>- Method of first angle and third angle projections (definition and difference)<br>- Symbol of 1st angle and 3rd angle projection as per IS specification. |
| 8. | | Drawing of Orthographic projection from isometric/3D view of blocks |
| 9. | | Orthographic Drawing of simple fastener (Rivet, Bolts, Nuts & Screw) |
| 10. | | Drawing details of two simple mating blocks and assembled view. |

## 9.2 EMPLOYABILITY SKILLS

| 1st Semester | |
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| **1. English Literacy** | **Duration : 20 Hrs.**<br>**Marks : 09** |
| **Pronunciation** | Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech) |
| **Functional Grammar** | Transformation of sentences, Voice change, Change of tense, Spellings. |
| **Reading** | Reading and understanding simple sentences about self, work and environment |
| **Writing** | Construction of simple sentences Writing simple English |
| **Speaking / Spoken English** | Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication. |
| **2. I.T. Literacy** | **Duration : 20 Hrs.**<br>**Marks : 09** |
| **Basics of Computer** | Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer. |
| **Computer Operating System** | Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications. |
| **Word processing and Worksheet** | Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document.<br>Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets. |
| **Computer Networking and Internet** | Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks),<br>Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication.<br>Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes. |

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| **3. Communication Skills** | **Duration : 15 Hrs.**<br>**Marks : 07** |
| **Introduction to Communication Skills** | Communication and its importance<br>Principles of Effective communication<br>Types of communication - verbal, non verbal, written, email, talking on phone.<br>Non verbal communication -characteristics, components-Para-language Body language<br>Barriers to communication and dealing with barriers.<br>Handling nervousness/ discomfort. |
| **Listening Skills** | Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.<br>Triple- A Listening - Attitude, Attention & Adjustment.<br>Active Listening Skills. |
| **Motivational Training** | Characteristics Essential to Achieving Success.<br>The Power of Positive Attitude.<br>Self awareness<br>Importance of Commitment<br>Ethics and Values<br>Ways to Motivate Oneself<br>Personal Goal setting and Employability Planning. |
| **Facing Interviews** | Manners, Etiquettes, Dress code for an interview<br>Do's & Don'ts for an interview. |
| **Behavioral Skills** | Problem Solving<br>Confidence Building<br>Attitude |
| **2nd Semester** | |
| **4. Entrepreneurship Skills** | **Duration : 15 Hrs.**<br>**Marks : 06** |
| **Concept of Entrepreneurship** | Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business. |
| **Project Preparation & Marketing analysis** | Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix. |
| **Institutions Support** | Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & |

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| | procedure & the available scheme. |
| **Investment Procurement** | Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes. |
| **5. Productivity** | **Duration : 10 Hrs.**<br>**Marks : 05** |
| **Benefits** | Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard. |
| **Affecting Factors** | Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down. |
| **Comparison with developed countries** | Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages. |
| **Personal Finance Management** | Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance. |
| **6. Occupational Safety, Health and Environment Education** | **Duration : 15 Hrs.**<br>**Marks : 06** |
| **Safety & Health** | Introduction to Occupational Safety and Health importance of safety and health at workplace. |
| **Occupational Hazards** | Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention. |
| **Accident & safety** | Basic principles for protective equipment.<br>Accident Prevention techniques - control of accidents and safety measures. |
| **First Aid** | Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person. |
| **Basic Provisions** | Idea of basic provision legislation of India.<br>safety, health, welfare under legislative of India. |
| **Ecosystem** | Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance. |
| **Pollution** | Pollution and pollutants including liquid, gaseous, solid and hazardous waste. |
| **Energy Conservation** | Conservation of Energy, re-use and recycle. |
| **Global warming** | Global warming, climate change and Ozone layer depletion. |
| **Ground Water** | Hydrological cycle, ground and surface water, Conservation and Harvesting of water. |

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| **Environment** | Right attitude towards environment, Maintenance of in -house environment. |
| **7. Labour Welfare Legislation** | **Duration : 05 Hrs.**<br>**Marks : 03** |
| **Welfare Acts** | Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act. |
| **8. Quality Tools** | **Duration : 10 Hrs.**<br>**Marks : 05** |
| **Quality Consciousness** | Meaning of quality, Quality characteristic. |
| **Quality Circles** | Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles. |
| **Quality Management System** | Idea of ISO 9000 and BIS systems and its importance in maintaining qualities. |
| **House Keeping** | Purpose of House-keeping, Practice of good Housekeeping. |
| **Quality Tools** | Basic quality tools with a few examples. |

## ANNEXURE-I

| LIST OF TOOLS AND EQUIPMENT | | | |
|---|---|---|---|
| **PLUMBER (For Batch of 20 Candidates)** | | | |
| **S No.** | **Name of the Tool & Equipment** | **Specification** | **Quantity** |
| **A. TRAINEES TOOL KIT ( For each additional unit trainees tool kit Sl. 1-17 is required additionally)** | | | |
| 1 | Rule Steel | 300 mm both in inch and mm | 21 Nos. |
| 2 | Rule Wooden 4 fold | 600 mm | 21 Nos. |
| 3 | Hacksaw Frame adjustable | 250 to 300 mm | 21 Nos. |
| 4 | Scriber | 200 mm | 21 Nos. |
| 5 | Centre punch | 100 mm | 21 Nos. |
| 6 | Chisel Cold, flat | 20 mm | 21 Nos. |
| 7 | Hammer ball pein | 800 grams | 21 Nos. |
| 8 | Hammer ball pein | 50 grams | 21 Nos. |
| 9 | File flat rough | 300 mm | 21 Nos. |
| 10 | Level spirit wooden | 300 mm | 21 Nos. |
| 11 | Plumb bob | 50 grams | 21 Nos. |
| 12 | Trowel | C-125-I S: 6013 | 21 Nos. |
| 13 | Stillson wrench | 200 & 350 mm | 21 Nos. |
| 14 | Screw Driver | 250 mm | 21 Nos. |
| 15 | Wooden Mallet small | I S: 2022 | 21 Nos. |
| 16 | Cutting pliers 200mm | I S : 3650 | 21 Nos. |
| 17 | Steel tape | 5 m | 21 Nos. |
| **B. TOOLS, MEASURING INSTRUMENTS AND GENERAL SHOP OUTFIT - For 2 (1+1) units no additional items are required** | | | |
| 18. | Surface plate | 400 X400 mm Grade I | 1no. |
| 19. | Marking Table | 900X600X900mm high | 1no. |
| 20. | 'V' Blocks with clamps | 80/7-63A IS 2949 | 2nos. |
| 21. | Combination set | 200 mm | 1no. |
| 22. | Scribing Block, Universal, | 300 mm | 2nos. |
| 23. | Hand Vice, Jaw | 50 mm | 2nos. |
| 24. | File Flat, Smooth | 200 mm | 2nos. |
| 25. | File Half Round, Rough | 300 mm | 2nos. |
| 26. | File, Square, rough | 250 mm | 2nos. |
| 27. | File, Square, Smooth | 200 mm | 2nos. |
| 28. | File Triangular Rough | 250 mm | 2nos. |
| 29. | File Flat Rasp | 250 mm | 2nos. |

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| 30. | File Triangular Smooth | 200 mm | 2nos. |
| 31. | Chisel Cold Flat | 20 mmX300mm | 2nos. |
| 32. | Chisel Cross Cut | 6X150 mm I S-402 | 2nos. |
| 33. | Chisel Round Nose | 3X150 mm I S -402 | 2nos. |
| 34. | Chisel Diamond Point | 6X150mm | 2nos. |
| 35. | Tap and Die set to cut B.S.F. , B.S.W. and metric threads | sizes No.6 to M-12 | 1 set each |
| 36. | Screw Pitch gauge to cover above threads | | 1set |
| 37. | Punch , Letter set | | 1no. |
| 38. | Punch , Number set | | 1no. |
| 39. | Saw Plumber | 300mm | 2 Nos. |
| 40. | Spanner monkey up to | 50mm | 2Nos. |
| 41. | Stove melting solder | | 1Nos |
| 42. | Cutter ,Pipe, wheel type | 6mm to 25mm | 1 Nos. |
| 43. | Oil stone | 150X50X25mm | 2 Nos |
| 44. | Soldering Iron , Copper , Bit , Fire heated , Hatched , Straight , | 500 grams | 4 Nos. |
| 45. | Snip Straight | 250mm | 2 No. |
| 46. | Snip bend | 250mm | 2 No. |
| 47. | Try square | 200mm | 2 Nos. |
| 48. | Inside Caliper | 150mm | 2 Nos |
| 49. | Caliper outside | 150mm | 2 Nos |
| 50. | Odd leg calliper | 200mm | 2 Nos. |
| 51. | Tenon saw | | 2 Nos. |
| 52. | Hand Saw. | | 2 Nos |
| 53. | Mortise Chisel | | 2 Sets |
| 54. | Firmer Chisel | | 2 Sets. |
| 55. | Mallet Medium | IS: 2922 | 2 Nos. |
| 56. | Jack plane | | 2 Nos. |
| 57. | Gas Welding set with oxygen acetylene cylinder | | 1 No. |
| 58. | Goggles pair welder | 100 mm | 2 pairs. |
| 59. | Brush Steel Wire | 150X 50 mm | 1 No. |
| 60. | Table welding | 1200X 750 mm with fire bricks top and stand | 1 NO. |
| 61. | Pliers combination, | 200 mm | 2 Nos. |
| 62. | Blow lamp | 500 mililitre | 2Nos. |
| 63. | Washer cutter | | 1 No. |
| 64. | Mirror | 100X150 mm | 2 Nos. |
| 65. | Scribing gauge | | 1 No. |
| 66. | Soil pot with brush | | 1 No. |
| 67. | Pot- Hook | | 1 No. |
| 68. | D. E. Spanners | 7X8, 10X11, 13X17, 19X22, 24X27 IS:2028 | 2 Sets |

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| 69. | Branch Gimlets | | 2 Nos. |
| 70. | Bending Spring | | 1 Set |
| 71. | Plumbers Laddle | | 2nos |
| 72. | Tool caulking set of S | | 2 nos. |
| 73. | Plumbers' metal melting pot | 10 kg | 1 no. |
| 74. | Pipe stock and dies complete with stocks, bushing , bushing holders, Taps and wrenches sizes covered, to suit pipes | bore dia 6,8,10,20,25,32,40,&50mm | 4 sets |
| 75. | Pipe vice | to grip up to 77 mm IS -2587 | 8 nos. |
| 76. | Stillson pattern pipe wrenches | 450 mm to take pipe up to 52 mm dia IS -4003 | 2sets |
| 77. | Stillson pattern pipe wrenches | 300mm to take pipe 20 mm to 32mm | 2sets |
| 78. | Chain :pipe wrench | 90mm -650 IS 4123 | 2sets |
| 79. | Adjustable, spanner, A-375, IS- 6149 | | 2nos |
| 80. | Anvil | 50 or 63 kg. IS- 510 | 1no |
| 81. | Pipe bender, manually operated | | 1no |
| 82. | Leg vice, 75mm jaw on Stand IS -2588 | | 1no |
| 83. | Hand drill 6mm capacity with drill chuck (Electric) | | 1no |
| 84. | Drill Twist (straight shank ) | 3mm to 6mm | 1set |
| 85. | Portable forge , | 450mmwith hand blower | 1no |
| 86. | Flat smithy tong | | 2nos. |
| 87. | working bench | 2400x1200x750mm with 4 voice 125 mm jaws | 2nos. |
| 88. | Bath tub small size | | 1no. |
| 89. | Wash Basin Equivalent metric | (16"X14"X10") | 2nos. |
| 90. | Water Heater | 10 litres | 1no |
| 91. | Water closet (European type p) complete with over head cistern | | 1set |
| 92. | Water closet (Indian type ) complete with over head cistern | | 1set |
| 93. | Urinal wall type complete with automatic system | | 1set |
| 94. | Water meter | | 2nos. |
| 95. | Steel lockers | with 8 drawers Metal rack (1800x1500x450mm) | 3nos. |
| 96. | Metal rack | (1800X1500X450mm) | 1no |
| 97. | Desk | | 1nos |
| 98. | Stool | | 1 nos |
| 99. | Black Board with glass | | 1no |
| 100. | Fire Extinguisher | | 1no |
| 101. | Fire Buckets with stand | | 1nos. |

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| 102. | Steel Almirah (large) | | 1no |
| 103. | Hammering drilling machine | | 1no. |
| 104. | Electric PPR pipe welding machine | | 1 No |
| 105. | Electric pump, | 1 HP | 1 no. |
| 106. | D.E. Pedestal grinder with two wheels 175mm rough and smooth | | 1 No. |
| 107. | Hydraulic pressure machine for testing leakage in GI pipe fittings etc. | | 1No. |
| 108. | Sight rail and bonning rod | | 1 No. |
| 109. | Rachet pipe die | 15 mm to 32 mm | 1 No. |
| 110. | Bench drilling machine with chuck and key upto 15mm capacity | | 1 No. |
| 111. | Double face hammers | | 2 No. |
| 112. | Dormat, Pickaxe, Spade, Girmale | | 1 each |
| 113. | Pipe bender(Hydraulic type) | | 1 No. |
| 114. | Instructor table | | 1 No. |
| 115. | Instructor chair | | 1 No. |
| 116. | Solar water heater system | | 1No |
| 117. | Ring guage | 15 mm,20mm,25mm,32mm | 1 each |
| **C. LIST OF CONSUMABLE** | | | |
| 118. | M.S FLAT | | As Required |
| 119. | M.S ROD | | As Required |
| 120. | GI pipe "B" grade | ½"Ø, ¾"Ø, 1"Ø | As Required |
| 121. | GI pipe fittings<br>Socket<br>Tee<br>Bend<br>Union<br>Hex Nipple | ½"Ø, ¾"Ø, 1"Ø | As Required |
| 122. | Wooden plank | 50 mm x 25 mm x 1 m 100 mm x 25mm x 1 m | As Required |
| 123. | MS gas welding filler rod | | As Required |
| 124. | Wire cut clay bricks | | As Required |
| 125. | River sand AFS | no.100 ~ 40 | As Required |
| 126. | Stone aggregate | | As Required |
| 127. | Cement portland | | As Required |
| 128. | Copper tubes | 6 mm Ø, 25 mm Ø | As Required |

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| 129. | Copper brazing filler rod | | As Required |
| 130. | PVC pipes heavy duty | (suitable to use dies and tap) ½"Ø, ¾"Ø, 1"Ø, 1½"Ø, 2"Ø , 4"Ø, 6" Ø | As Required |
| 131. | PVC pipe light duty | ½"Ø, ¾"Ø, 1"Ø, 1½"Ø, 2"Ø | As Required |
| 132. | PVC fittings - reducer FTA Reducer, Plain coupling, TEE, Bend, Elbow, MTA, FTA , socket | ½"Ø, ¾"Ø, 1"Ø, 1½"Ø, 2"Ø , 4"Ø, 6" Ø | As Required |
| 133. | C.PVC pipe | 20 mm Ø | As Required |
| 134. | PPR pipe | 20mm Ø | As Required |
| 135. | AC sanitary pipe coupling | 100 mm Ø | As Required |
| 136. | AC pressure pipe coupling | 100 mm Ø | As Required |
| 137. | CI water supply pile bell and spigot end | | As Required |
| 138. | CI water supply pipe flanged end | | As Required |
| 139. | Wheel valve | | As Required |
| 140. | Globe valve | | As Required |
| 141. | PVC ball valve | | As Required |
| 142. | Water tap/ PVC, S.S, Brass size | ½", ¾", 1" | As Required |
| 143. | Non- return valve, Air valve | | As Required |
| 144. | M.S flange | | As Required |
| 145. | C.I.D joint | 100mm | As Required |
| 146. | Lubricating oil | | As Required |
| 147. | Lead | | As Required |
| 148. | Spum yarn | | As Required |
| 149. | Oxygen gas | | As Required |
| 150. | Acetylene gas | | As Required |
| 151. | Water meter | | As Required |
| 152. | PVC bend | 100 mm | As Required |

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| 153. | PVC Y branch | 100 mm | As Required |
| 154. | PVC Dod bend | 100 mm | As Required |
| 155. | PVC pipe sloe | | As Required |
| 156. | C.P piller tap | 15 mm | As Required |
| 157. | C.P waste coupling | 35 mm | As Required |
| 158. | PVC waste pipe | 32 mm | As Required |
| 159. | Rock bolt | | As Required |
| 160. | PVC connection flexible tube | | As Required |
| 161. | Hot and cold water mixer tap | | As Required |
| 162. | PPR pipe fittings | PPR - TEE 20 mm<br>PPR - Elbow 20 mm | As Required |
| 163. | PVC floor trap | | As Required |
| 164. | PVC gully trap | | As Required |
| 165. | PVC multi trap | | As Required |
| 166. | PVC multi floor trap | | As Required |
| 167. | White cement | | As Required |
| 168. | P O P (Plaster of paris) | | As Required |
| 169. | Gasket's etc | | As Required |
| 170. | Push lock | | As Required |
| ***Note: - All the tools and equipment are to be procured as per BIS specification.*** | | | |

| TOOLS & EQUIPMENT FOR EMPLOYABILITY SKILLS | | |
|---|---|---|
| **S No.** | **Name of the Equipment** | **Quantity** |
| 1. | Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software | 10 Nos. |
| 2. | UPS - 500VA | 10 Nos. |
| 3. | Scanner cum Printer | 1 No. |
| 4. | Computer Tables | 10 Nos. |
| 5. | Computer Chairs | 20 Nos. |
| 6. | LCD Projector | 1 No. |
| 7. | White Board 1200mm x 900mm | 1 No. |
| ***Note: -*** *Above Tools &Equipments not required, if Computer LAB is available in the institute.* | | |

## ANNEXURE-II

# FORMAT FOR INTERNAL ASSESSMENT

| | | |
|---|---|---|
| **Name & Address of the Assessor:** | | **Year of Enrollment:** |
| **Name & Address of ITI (Govt./Pvt.):** | | **Date of Assessment:** |
| **Name & Address of the Industry:** | | **Assessment location: Industry/ ITI** |
| **Trade Name:** | **Semester:** | **Duration of the Trade/course:** |
| **Learning Outcome:** | | |

| **S No.** | **Candidate Name** | **Father's/Mother's Name** | Safety Consciousness | Workplace Hygiene | Attendance/ Punctuality | Ability to Follow Manuals/ Written Instructions | Application of Knowledge | Skills to Handle Tools & Equipment | Economical Use of Materials | Speed in Doing Work | Quality in Workmanship | VIVA | **Total Internal Assessment Marks** | **Result (Y/N)** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Maximum Marks (Total 100 Marks)** | | | **15** | **5** | **10** | **5** | **10** | **10** | **5** | **10** | **15** | **15** | | |
| **1** | | | | | | | | | | | | | | |
| **2** | | | | | | | | | | | | | | |