CURRICULUM GUIDE

F
O
R

Construction Technician

(A Modular Approach)

Council for Technical Education and Vocational Training

Curriculum Development Division

Sanothimi, Bhaktapur

First revision, 2007

Table of Contents

Introduction

The competency based and market oriented curriculum guide for **Construction Technician** is designed to produce employable multi skilled construction technicians equipped with knowledge, skills and attitudes. In this curriculum, the trainees will practice skills of construction works in the construction industries. Once the competencies acquire by trainees, they will have ample opportunity for employment and self-employment through which this program will contribute in the national streamline of poverty reduction in the country.

The features of this curriculum are to focus the generic skills which are needed to adopt with the new situation and technology, entrepreneurial skills are also incorporated to focus self-employment, bench work, basic mathematics, basic English and basic drawing to improve their basic knowledge and skills level and make them competent construction technician needed for the occupation. Another major feature of the curriculum is to incorporate the drop-out youths who have only class seven schooling experience. The curriculum is designed into modular modality so that the curriculum will be successful to deliver the individual needs and the needs of industry and community.

Aim

The main aim of this program is to produce employable multi skilled construction technicians who could provide construction services in the construction industries in the country and abroad.

Objectives

After completion of training the trainees will be able to:

1. Perform bench work related to shuttering, scaffolding, bar bending, plumbing and housewarming.
2. Apply simple English language for communication.
3. Perform simple mathematical problem related to occupation.
4. Apply construction drawings.
5. Develop entrepreneur skills related to construction.
6. Develop generic skills for adopting new situation and technologies.
7. Perform stone masonry work, brick masonry work and hollow block works.
8. Perform bathroom tiling, kitchen tiling as well as passage and stair tiling fitting works.
9. Erect formworks for foundation and super structure components.
10. Erect dependent and independent bamboo and wood arrangement scaffoldings and tubular type scaffolding.
11. Perform bar bending, binding and bar placing works
12. Carryout installation as well as repairing and maintenance of house water supply system.
13. Perform installation as well as repairing and maintenance of sanitary system.
14. Develop skills in performing house wiring with smart facilities.
15. Repair components of damaged wiring system.

Course Description

This curriculum guide is based on the job required to be performed by a multi skilled Construction Technician at construction industries in Nepal and abroad. Therefore, this curriculum guide is designed to equip the trainees with skills & knowledge in the field of construction. This curriculum is designed in modular approach with the prerequisite of

basic general course. The basic general module consists of Bench Work, Basic English, Basic Mathematics, Basic Drawing, Entrepreneurship and Generic Skills. Moreover, this curriculum guide consists of three specialized modules, is a complete package of Construction Technician. These modules are: (1) Masonry and Tile Fitting (2) Shuttering Carpentry, Scaffolding, Bar Bending and (3) Plumbing and House Wiring. Similarly, on-the- Job Training is included to provide the trainees to experience and practice the critical competencies as well. The duration of particular modules are mentioned on the following course structure. There will be two-way demonstration by instructors/trainers and the trainees get opportunity to perform skills/tasks necessary for this level of multi skilled construction. Trainees will practice & learn skills using typical tools, equipment, machines and materials necessary for the program.

Duration

The total duration of the course extends over 12 months (i.e. 8 x130 or 1040 hours in house training + 4x160 or 640 hours OJT= 1680 hours total duration). The total duration of in-house training and OJT are 8 months and 4 months respectively. After the completion of each module the trainees should undergo OJT for the period as mentioned on the course structure. Trainees will learn and practice at the institution and they will experience real exposure of work during the period of OJT. To make the trainees competent and orient them for self-employment, entrepreneurial skills will be provided at the beginning of training under Basic General Course.

Target Group

The target group for this training program will be all interested individuals in the field of multi skilled construction; with educational prerequisite of minimum class seven pass.

Target location

The target group for this training program will be from all over Nepal.

Group Size

The group size of this training program will be maximum 30, provided all necessary resources to practice the tasks/ competencies as specified in this curriculum guide.

Medium of Instruction

The medium of instruction for this program will be Nepali or English or both

Pattern of Attendance

The trainees should have 80% attendance in theory classes and 90% in practical/ performance to be eligible for internal assessments and final examinations.

Focus of Curriculum

This is a competency-based curriculum. This curriculum emphasizes on competency performance. 80% time is allotted for performance and remaining 20% time is for related technical knowledge. So, the main focus will be on performance of the specified competencies in the curriculum. The provision of OJT is made to practice the critical tasks during the stated period.

Entry Criteria

Individuals who meet the following criteria will be allowed to enter into this program:

- Minimum of seven class pass or equivalent
- Minimum of 15 years of age
- Citizenship certificate (for the name, parents' name, age, date of birth and address verification purpose only)
- Should pass entrance examination

Instructional Media and Materials

The following instructional media and materials are suggested for the effective instruction and demonstration.

- ***Printed Media Materials*** (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packets, Procedure sheets, Performance Check lists, Textbooks etc.).
- ***Non-projected Media Materials*** (Display, Models, Flip chart, Poster, Writing board etc.).
- ***Projected Media Materials*** (Opaque projections, Overhead transparencies, Slides etc.).
- ***Audio-Visual Materials*** (Audiotapes, Films, Slide-tape programs, Videodiscs, Videotapes etc.).
- ***Computer-Based Instructional Materials*** (Computer-based training, Interactive video etc.).

Teaching Learning Methodologies

The methods of teachings for Construction Technician program will be a combination of several approaches. Such as Illustrated Lecture, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork and Other Independent learning.

- Theory: Lecture, Discussion, Assignment, Group work.
- Practical: Demonstration, Observation, Guided practice and Self-practice.

Follow up Provision

First follow up: Six months after the completion of the program

Second follow up: Six months after the completion of the first follow up

Follow up cycle: In a cycle of one year after the completion of the second follow up for five years

Grading System

The trainees will be graded as follows based on the marks in percentage secured by them in tests/ evaluations.

- Distinction: Passed with 80% or above
- First Division: passed with 75% or above
- Second Division: passed with 65% or above
- Third Division: passed with 60% or above

Trainees Evaluation Details

- Continuous evaluation of the trainees' performance is to be done by the related instructor/ trainer to ensure the proficiency over each competency under each area of sub-module.
- Related technical knowledge learnt by trainees will be evaluated through written or oral tests as per the nature in the institutional phase of training.
- Trainees must secure minimum marks of 40% and 60% in theory and practical evaluations respectively.
- There will be three internal evaluations and one final evaluation in each module at institution.
- The ratio between internal and final examination of knowledge test will be 20:80 but for the performance test it will just reverse.
- The entrance test will be administered by the concerned training institute
- The OJT will be evaluated according to the OJT details stated in the curriculum

Trainers' Qualification (Minimum)

- Diploma in civil/electrical engineering or equivalent in related field
- Good communicative and instructional skills
- Experience in related field

Trainer-Trainees Ratio

- In theory classes 1(trainer): 20 (trainees)
- In practical classes (in workshop and laboratory) 1(trainer): 10 (trainees)

Suggestions for Instruction

1. **Select objectives**
   - Write objectives of cognitive domain.
   - Write objectives of psychomotor domain.
   - Write objectives of affective domain
2. **Select Subject matter**
   - Study subject matter in detail.
   - Select content related to cognitive domain.
   - Select content related to psychomotor domain.
   - Select content related to affective domain.
3. **Select Instructional Methods**
   - Teacher centered methods: like lecture, demonstration, question answers inquiry, induction and deduction methods.
   - Student initiated methods like experimental, field trip/excursion, discovery, exploration, problem solving, and survey methods.
   - Interaction methods like discussion, group/team teaching, microteaching and exhibition.
   - Dramatic methods like role play and dramatization
4. Select Instructional method (s) on the basis of objectives of lesson plans and KAS domains.
5. Select appropriate educational materials and apply at right time and place.
6. Evaluate the trainees applying various tools to correspond the KAS domains.
7. Make plans for classroom / field work / workshop organization and management.
8. Coordinate among objectives, subject matter and instructional methods.
9. Prepare lesson plan for theory and practical classes.
10. Deliver /conduct instruction / program.
11. Evaluate instruction/ program.

Special suggestion for the performance evaluation of the trainees

1. Perform task analysis.
2. Develop a detail task performance checklist.
3. Perform continuous evaluation of the trainees by applying the performance checklist.

Suggestion for skill training

1. Demonstrate task performance in normal speed.
2. Demonstrate slowly with verbal description of each and every step in the sequence of activity of the task performance using question and answer techniques.
3. Repeat 2 for the clarification on trainees demand if necessary.

4. Perform fast demonstration of the task.

Provide trainees the opportunities to practice the task performance demonstration

1. Provide opportunity to trainees to have guided practice.
2. Create environment for practicing the demonstrated task performance.
3. Guide the trainees in each and every step of task performance.
4. Provide trainees to repeat and re-repeat as per the need to be proficient on the given task performance.
5. Switch to another task demonstration if and only trainees developed proficiency in the task performance.

Other suggestions

1. Apply principles of skill training.
2. Allocate 20% time for theory classes and 80% time for task performance while delivering instructions.
3. Apply principles of learning relevant to the learners' age group.
4. Apply principles of intrinsic motivation.
5. Facilitate maximum trainees' involvement in learning and task performance activities.
6. Instruct the trainees on the basis of their existing level of knowledge, skills and attitude.

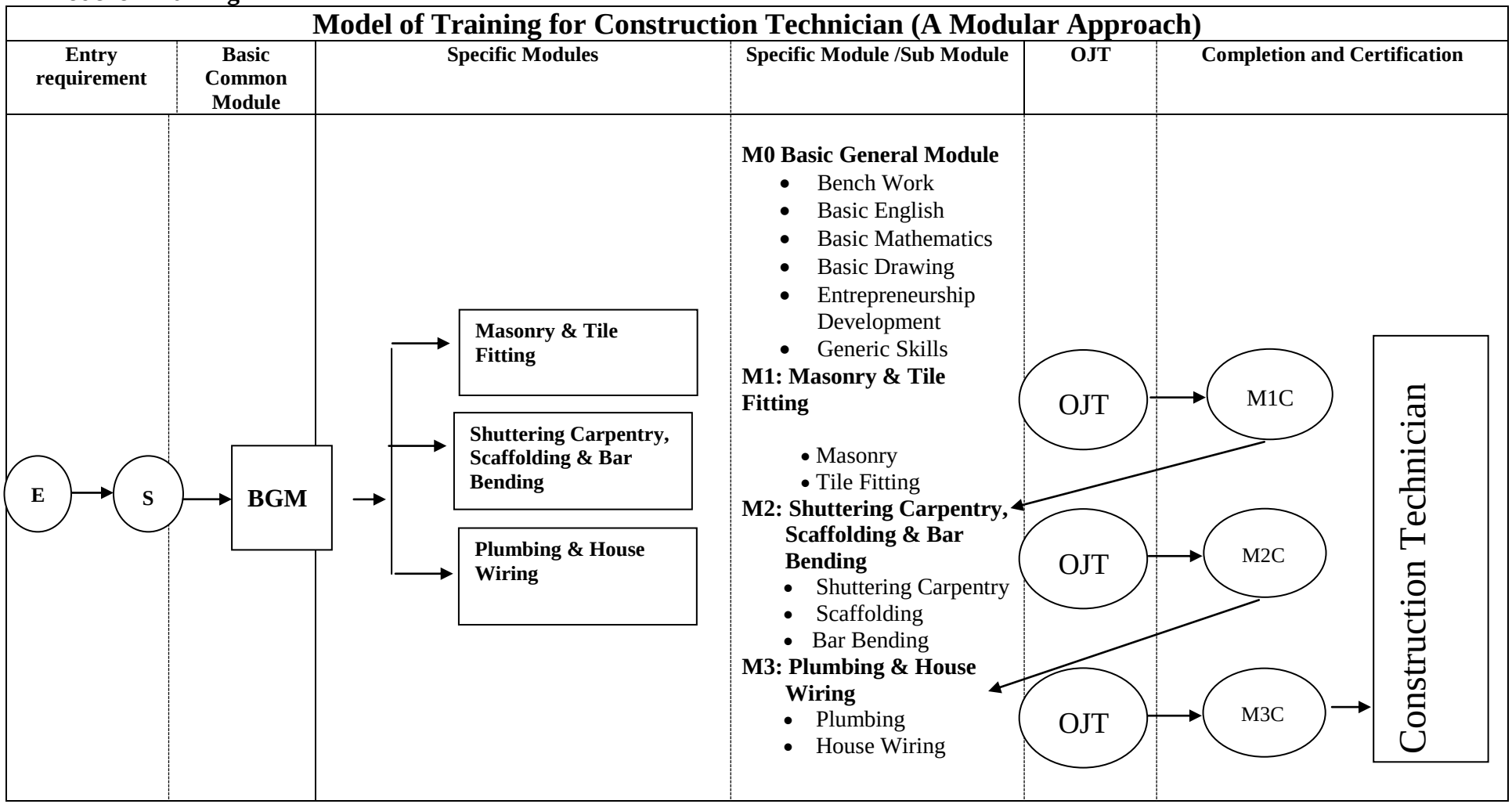
Certificate Requirements

The related training institute will provide the certificate of "**Construction Technician**" based on the prescribed in house training and related OJT completed as per the model of the curriculum. However; individuals who complete module(s) of the institutional training will receive the certificate of the particular module completed. Moreover, even for particular module takers, they should undergo OJT as suggested in course structure for each module.

Skill Testing Provision

The graduates who have the completion certificate of this program may sit in the skill test examination of level two (L- 2).

Model of Training



E = Entry
S = Start
BGM = Basic General Module
M1 C = Module 1 Certification
M2 C = Module 2 Certification
M3 C = Module 3 Certification

Course Structure for Construction Technician

S.N.	Code	Modules and sub-modules	Nature	Total hours	Full marks
1.	**M 0**	**Mo: Basic General Module** • Bench Work • Basic English • Basic Mathematics • Basic Drawing • Entrepreneurship Development • Generic Skills	**T+P**	**230** 50 30 30 80 20 20	**200**
2	**M 1**	**M1: Masonry and Tile Fitting** • Masonry • Tile Fitting	**T+P**	**340** 260 80	**300**
3.	**M 2**	**M2: Shuttering Carpentry, Scaffolding and Bar Bending** • Shuttering Carpentry • Scaffolding • Bar Bending	**T+P**	**210** 70 70 70	**200**
4	**M 3**	**M3: Plumbing and House Wiring** • Plumbing • House Wiring	**T+P**	**260** 130 130	**200**
Total				**1040**	**900**

OJT on Specific Modules for Construction Technician

S.N.	Code	Modules and sub-modules	Nature	Total hours	Full marks
1	**M 1**	**M1: Masonry and Tile Fitting** • Masonry • Tiling	**P**	**320**	200
2.	**M 2**	**M2: Shuttering Carpentry, Scaffolding and Bar Bending** • Shuttering Carpentry • Scaffolding • Bar Bending	**P**	**160**	100
3	**M 3**	**M3: Plumbing and House Wiring** • Plumbing • House Wiring	**P**	**160**	100
Total (4 months)				**640**	**400**
Grand total				**1680**	**1300**

Note: OJT commences after the completion of above-mentioned particular module(s)

Module Code: M 0

Module Title: Basic General Module

Description

This course is designed to equip trainees with the knowledge and skills on Basic General Module as a prerequisite for mastering any specialized modules. This course provides foundation for modular approach training in construction technician. This course deals with Basic English, Basic Mathematics, Entrepreneurship Development, Generic Skills, Basic Drawing and Bench work related to all modules as mentioned in the course structure.

Aim

This module aims to equip trainees with knowledge and skills to master any specific module.

Objectives

After completion of this basic general course the trainees will be able to:

1. Perform bench work related to shuttering, scaffolding, bar bending, plumbing and housewarming.
2. Apply simple English language for communication.
3. Perform simple mathematical problem related to occupation.
4. Apply construction drawings.
5. Develop entrepreneur skills related to construction
6. Develop generic skills for adopting new situation and technologies.

Prerequisite: Nil

Duration: 230 hours

Module Structure (M 0)

S.N.	Code	Sub-modules	Nature	Total hours	Full marks
1	SM 0.1	Bench Work	T+P	50	50
2	SM 0.2	Basic English	T	30	25
3	SM 0.3	Basic Mathematics	T	30	25
4	SM 0.4	Basic Drawing	T+P	80	50
5	SM 0.5	Entrepreneurship Development	T+P	20	25
6	SM 0.6	Generic Skills	T	20	25
Total				**230**	**200**

Module Code: M 0
Sub module Code: SM 0.1
Sub module Title: Bench Work

Description
This sub module is designed to equip trainees with the knowledge and skills on Bench Work as a prerequisite course for mastering any specific module/s. This course deals with Masonry, Tiling, Shuttering Carpentry, Scaffolding, Bar Bending, Plumbing and House Wiring related bench work needed for multi skilled construction technician.

Duration: 50 hours

Competencies in Bench Work

1. Orient with safety rules.
2. Measure/mark/file/saw work piece
3. Make rectangular block
4. Drill a hole
5. Measure the dimension using vernier caliper
6. Perform the punching
7. Perform the folding
8. Perform the bending
9. Perform cable/wire Joint (straight, T- Joint, married, Britannia)
10. Make wire/cable eyelet.
11. Perform soldering
12. Perform crimping
13. Prepare semi circular wooden formwork for column.
14. Prepare semi circular clamp for column formwork.
15. Prepare wooden arch formwork.
16. Cut tile as per required size.
17. Bend Re-bar (90, 45^0, U-bar).

Task Analysis

Task: 1 Orient with safety rules.

Time : 1 hr
Theory: 1 hr
Practical: hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Define safety. 2. Enlist importance of safety precaution. 3. Enlist workshop hazards. 4. Enlist safety rules and regulation.	**Condition (Given):** Class room OHP/transparency, white board, marker, handouts, safety poster and safety wears **Task (What):** Orient with safety rules. **Standard (How well):** Various safety rules oriented. Various safety wears and poster identified.	➢ Define safety ➢ Importance of safety precaution ➢ Workshop hazards ➢ Safety rules and regulations

Required Tools/equipment:
Safety:
...

Task Analysis

Task No: 2 Measure/mark/file/saw work piece.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1 Measurement: 1.1 Measure the dimension. (Inch/centimeter, millimeter, meter) **2. Marking**: 2.1 Measure the dimension as per drawing. 2.2 Mark the point by using scriber or pencil. **3. Filling** 3.1 Read drawing 3.2 Measure the work piece by using scale. 3.3 clamp work piece on the vice. 3.4 File the work piece using appropriate file. 3.5 Check filling surface level and perpendicular using by back square. 3.6 Measure the final dimension. 3.7 Clean work place. **4. Sawing**: 4.1 Mark on the work piece as per drawing. 4.2 Clamp the work piece on the bench vice. 4.3 Collect and fix hacksaw blade on hacksaw. 4.4 Saw on the work piece. 4.5 Apply coolant. 4.6 Clean all tools & equipment & put at proper place 4.7 Clean working place.	**Condition (Given):** Workshop, necessary tools equipment and material **Task (What):** Measure/mark/file/saw work piece **Standard (How well):** Work piece measured. Work piece filed. Right angle maintained. Straight sawn.	➢ Measurement system ➢ Conversion of units ➢ Marking system ➢ Method of filing ➢ Method of sawing ➢ Identification of tools ➢ Procedure ➢ Safety precautions

Tools/equipment: Marking scriber, measuring tape, file, and hack saw frame, steel scale & bench vice

Safety:

- Fix the saw blade properly
- Clamp the work piece properly.
- Apply coolant while sawing.
- Reduce pressure on saw just before the separation

Task Analysis

Task No: 3 make rectangular block.

Time : 3 hrs
Theory: .0.5 hr
Practical: 2.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain workshop drawing. 2. Obtain workshop material. 3. Obtain required tools. 4. Start filling & file first large surface according to drawing dimension. 5. Re-clamp the work piece, so that first surfaces open jay to file second side. 6. File down referring same steps as for first surface. 7. Check the right angle. 8. File further to make even flatness & to maintain right angle. 9. Remove the work piece & put vice jaw cover on the vice jaw. 10. Re-clamp the work piece, first surface toward open jaw, second jay toward fixed jaw, to file third side. 11. Remove the W/P & re-clamp. 12. Repeat the step 10 to 12. 13. Measure & maintain the thickness as required. 14. Check the final measurement. 15. Clean all tools & equipment & put at proper place 16. Clean working place. 17. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Produce Rectangular block. **Standard (How well):** Right angle checked. Flatness checked. Squareness checked.	➢ Concept of rectangular block ➢ Squareness & flatness checking procedure ➢ Safety precaution

Tools/equipment: Bench & bench vice, file set, steel rule, surface gauge and try square
Safety:

Task Analysis

Task No: 4 Drill a hole.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain drawing. 2. Obtain required tools and equipment. 3. Obtain finished work piece. 4. Mark layout line on the work piece. 5. Punch the center. 6. Clamp the work piece on the machine vice. 7. Mount the required drill bit on drill chuck. 8. Set up R.P.M. as per drill bit size. 9. Set coolant-housing pipe. 10. Start the machine & give hand feed. 11. Drill until obtaining required depth. 12. Stop the machine. 13. Remove the work piece from vice & clean it. 14. Measure the center & the hole size according to the drawing. 15. Remove the drill bit 16. Clean all tools & equipment & put at proper place 17. Clean working place. 18. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Drill a hole. **Standard (How well):** Work piece clamping checked. Drill bit mounting checked. Selection of R.P.M. checked. Accuracy & finishing of dimension checked.	➢ Importance of drill machine ➢ Types of drill machine. ➢ Drill bits & its types. ➢ Importance of speed feed R.P.M. ➢ Calculation of R.P.M. ➢ Procedure ➢ Safety precautions

Tools/equipment: Drill machine, drill bit set, refinished work piece, steel rule, scriber, center punch, hammer, safety goggles & coolant.

Safety:

- Tighten the work piece perfectly.
- Check drill bit cutting edge before drilling
- Use safety goggles.
- Never use very loose cloth, tie, chain etc.
- Use clan brush to clean the chips.
- Follow general safety rules.

Task Analysis

Task No: 5 Measure the dimension using vernier caliper.

Time: 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain pre machined W/P. 2. Obtain vernier caliper. 3. Clean the caliper & check that the caliper reads correctly. 4. Clean the work pieces & remove burrs. 5. Measure outside dimension. 6. Set the outside measuring jaw to a dimension larger than that to be measured. 7. Place the work piece between the two jaws. 8. Move the sliding jaw so that the caliper grips the W/P. 9. Make sure that the jaws are in full contact with W/P. 10. Read the number of millimeters on the main scale, which show in front of the zero of the vernier scale. 11. Read the tenths of mm (0.1) or twentieths (0.05) on the vernier scale. 12. Add together both reading 13. Measure inside dimension. 14. Set the inside measuring jaws of the caliper to a dimension smaller than the dimension be measured. 15. Place the jaws against the W/P. 16. Move the sliding jaw so that the caliper grafts the work piece. 17. Read the measurement as the out side dimension. 18. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material **Task (What):** Measure the dimension using vernier caliper. **Standard (How well):** All the steps followed in sequence. Outside & inside dimensions well measured.	➢ Introduction & Features of vernier caliper ➢ Reading scale & uses of vernier caliper ➢ Least count & care of vernier caliper ➢ Procedure ➢ Safety precautions

Tools/equipment: Vernier caliper

Safety:

- Clean the W/P & vernier caliper before use.
- Use vernier caliper only for measuring.
- Clean the vernier caliper after use & store it safely.

Task Analysis

Task: 6 Perform the punching.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain the required drawing. 2. Obtain the required work piece (mild steel). 3. Obtain the required tools. 4. Mark on work piece vice appropriately. 5. Clamp the work piece on vice appropriately. 6. Select the latter for number punch and size. 7. Hold the latter/number punch and punch by hammering. 8. Put the oil on work piece. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Perform the punching. **Standard (How well):** All the steps followed in sequence. Letters/ numbers punched in required sizes and numbers.	➢ Introduction to latter/number punch ➢ Method of punching ➢ Selecting size, distance of latter/number ➢ Procedure ➢ Safety precautions

Tools /Equipment: Latter punch, number punch, steel ruler, scriber, bench vice, hammer & oil can

Safety:

Task Analysis

Task: 7 Perform the folding.

Time : 3 hrs
Theory : 1 hr
Practical: 2 hrs.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain the required drawing. 2. Study the drawing carefully. 3. Obtain required work piece (sheet). 4. Obtain required tools. 5. Mark the lines on work piece according to the drawing. 6. Clamp the part of work piece on vice firmly. 7. Fold the parts of work piece by mallet hammering. 8. Put the number. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records. .	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Perform the folding. **Standard (How well):** All the steps performed in sequence. Folding well performed.	➢ Introduction to folding work ➢ Folding method ➢ Application of mallet hammer ➢ Procedure ➢ Safety precautions

Tools /Equipment: Steel scale, marking, scriber, mallet, hammer, bench, bench vice & try square

Safety: Don't apply more force while folding & use only mallet

Task Analysis

Task: 8 Perform the bending.

Time :3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain the required drawing. 2. Study the drawing carefully. 3. Obtain the required tools. 4. Obtain the required work piece (PVC/metal pipe). 5. Mark centre and bending area according to the drawing. 6. Clamp pipe on near centre on pipe vices firmly. 7. Hold the pipe vices handle in correct position. 8. Bend pipe slowly on the according bending degree. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):-** Workshop, necessary tools equipment and material including drawing **Task (What):-** Perform the bending. **Standard (How well):-** Pipe bended on right degree. Measurement well performed. Centre of bending well positioned.	➢ Introduction to bending and bending types ➢ Method of bending ➢ Safety precautions

Tools /Equipment: Steel scale, scriber, pipe vice, divider

Safety: Don't apply too much pressure while bending, do slowly

Task Analysis

Time : 3 hrs
Theory : 1 hr
Practical: 2 hrs.

Task: 9 Perform cable/wire Joint (straight, T- Joint, married, Britannia).

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain the required drawing. 2. Study the drawing. 3. Obtain the required tools. 4. Obtain the required wire/cable piece. 5. Measure and mark the wire/cable piece according to the drawing. 6. Cut the insulation of wire/cable by knife/cutting pliers/wire stripper. 7. Remove the insulation of wire/cable by pliers/wire stripper. 8. Over lap the stripping parts of wire/cable each other. 9. Twist the wire/cable each other slowly and carefully by pliers. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Perform cable/wire Joint (straight, T- Joint, married, Britannia). **Standard (How well):** All the steps followed in sequence. Cable well joined. Measurement performed.	➢ Introduction to wire/cable joint ➢ Types of joint ➢ Measured of joint ➢ Technique of insulation remove from wire/cable ➢ Safety precautions

Tools /Equipment: Knife, cable stripper, pliers, scriber, measuring tape etc

Safety: Don't scratch on wire

Task Analysis

Task: 10 Make wire/cable eyelet.

Time : 3 hrs
Theory : 1 hr
Practical: 2 hrs.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain the required drawing. 2. Study the drawing carefully. 3. Obtain the required tools. 4. Obtain the required work piece wire/cable. 5. Mark the wire/cable piece according to the drawing measurement. 6. Cut the insulation of mark wire/cable by knife/cutting pliers/wire stripper. 7. Remove the insulation of wire/cable by pliers/wire stripper. 8. Twist the stripping parts of wire/cable by long nose pliers carefully. 9. Check the eyelet hole inserting screw. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Make wire/cable eyelet. **Standard (How well):** All the steps followed in sequence. Wire/cable eyelet made as per specification.	➢ Introduction to eyelet and it's using ➢ Method of twisting ➢ Procedure ➢ Safety precautions

Tools /Equipment: Knife, cable stripper, pliers, scriber, measuring tape etc

Safety: Don't scathe on wire, do slowly

Task Analysis

Task: 11 Perform soldering.

Time : 4 hrs
Theory : 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain the required tools and materials. 2. Obtain the required work piece (wire joint). 3. Clean the joint of wire. 4. Pest the flux on joint. 5. Heat the soldering iron. 6. Touch the soldering iron tip on joint and heat joint. 7. Continue heat the joint and put the lead on tip while move lead every where of joint than move out tip from joint. 8. Cool the soldered wire few minute. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material **Task (What):** Perform soldering. **Standard (How well):** All the steps performed in sequence. Soldering well performed as per specification.	➢ Introduction to soldering ➢ Method the soldering ➢ Procedure ➢ Safety precaution

Tools /Equipment: Soldering accessories

Safety:

- Don't keep heated iron on table
- Don't touch heating tip
- Clean heating tip before soldering
- Switch off after the soldering

Task Analysis

Task: 12 Perform crimping .

Time : 3 hrs
Theory : 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain the required tools and materials. 2. Obtain the required work piece (cable/wire). 3. Mark on work piece (cable/wire) accordingly to the cable shoes size. 4. Cut the insulation by knife/cutter. 5. Move the insulation from cable by pliers. 6. Insert the cable shoes on cable. 7. Set the crimping tools on cable shoes size. 8. Hold the handle by both hand and crimp tightly. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material **Task (What):** Perform crimping. **Standard (How well):** All the steps followed in sequence. Cable shoes on cable inserted as per specification Cable shoes on cable shoe size set as per as per specification.	➢ Introduction ➢ Selection of cable shoes ➢ Procedure ➢ Safety precautions

Tools /Equipment: Knife, cable stripper, pliers, scriber, measuring tape etc

Safety: Don't insert finger in crimping tools

Task Analysis

Task No. 13 Prepare semi circular wooden formwork for column.

Time : 4 hrs
Theory : 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect wooden strip of 25 to 50mm wide. 2. Draw a circle of required radius on a paper or floor. 3. Also draw outer circle from the same center for the thickness of the wooden strip. 4. Draw semi circle for outer circle on a wooden board for making base for strips. 5. Cut semicircle on the wooden board in three in number. 6. Place the cut semicircle boards at each end and one in the middle of the strips. 7. Nail wooden strip on to the cut base from inside. 8. Prepare other Half of the circular form in the similar way. 9. Prepare But and bolt to hold the cut board for tightening the forma together. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Prepare semi circular wooden formwork for column. **Standard (How well):** All the steps followed in sequence. Semicircular wooden formwork for column prepared as per drawing.	➢ Concept of geometrical shape ➢ Procedure ➢ Safety precaution

Required tools/equipment: Cross cut saw, hack saw for cutting circular, hammer, chisel and working bench with clamps.
Safety: Wear safety boot.

Task Analysis

Task No. 14 Prepare semi circular clamp for column form work.		Time : 4 hrs Theory : 1 hr Practical: 3 hrs
Performance Steps	**Terminal Performance Objective**	**Related Technical Knowledge**
1. Obtain a wooden board of 25mm thick. 2. Draw semicircle on it. 3. Saw using hacksaw along the semicircle mark on the board to remove inside parts of the semicircle. 4. Make it two to make a full circle. 5. Make two wooden member of 50x50mm size for a clamp and long enough to hold 20mm diameter bolt. 6. Obtain two bolts and nuts, long enough to cover the board size and for tightening the clamp. 7. Clean all tools & equipment & put at proper place 8. Clean working place. 9. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Prepare semi circular clamp for column form work. **Standard (How well):** All the steps followed in sequence. Semicircular clamp for column from work prepared as per drawing.	➢ Concept of clamping with nut and bolt ➢ Procedure ➢ Safety precautions

Required tools/equipment: Cross cut saw, hack saw for cutting circular, hammer, chisel and working bench with clamps
Safety: Wear safety boot.

Task Analysis

Task No.15 Prepare wooden arch formwork.

Time : 4 hrs
Theory : 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Draw the arch of a given radius on a piece of paper in full scale. 2. Consider the outer portion of the arch has the finishing surface required. 3. Consider the arch is semicircular arch. 4. Prepare horizontal wooden member equal to diameter of the circle minus twice the thickness of wooden strip. 5. Place the member centrally at its center too. 6. Prepare struts to be fixed at certain angles to support load on the arch. 7. Fix the struts on the horizontal member in such a way that they are equal to the radius of the horizontal member. 8. Fix wooden strips equal to the thickness of arch across the struts and horizontal members. 9. Provide struts in more number to take strips on it.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Prepare wooden arch formwork. **Standard (How well):** All the steps followed in sequence. A wooden arch formwork prepared as per drawing	➢ Introduction to wooden arch form work ➢ Uses ➢ Procedure ➢ Safety precautions

Required tools/equipment: Cross cut saw, hack saw for cutting circular, hammer, chisel and working bench with clamps
Safety: Wear safety Boot.

Task Analysis

Task No. 16 Cut tile as into required size.

Time : 3 hrs
Theory : 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain drawing requiring various cut tiles. 2. Cut tiles using tile cutter. 3. Mark the line of cut on tiles. 4. Place the tile on the jaw of cutter. 5. Adjust the blade of the cutter on to the line of cut. 6. Adjust water supply system to the cutter. 7. Switch on the cutter and gently lower the blade of the cutter on to the fixed tile. 8. Water the cutting to soften the tile and wash away the dust. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Cut tile as per required size. **Standard (How well):** All the steps followed in sequence. Tiles cut as per required sizes.	➢ Standard sizes of tiles ➢ Handling of tile cutting machine. ➢ Safety precautions

Required tools/equipment: Tile cutter machine

Safety: Wear safety boot and safety goggles

Task Analysis

Time : 2 hrs
Theory : 1 hr
Practical: 1 hr

Task No. 17 Bend re-bar (90^0, 45^0 U-bar).

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Make Bench to about 1.2 m high or as per need of the bar bender. 2. Provide a strong bench on which three short steel bars are inserted. 3. Prepare five pieces of 16mm diameter 150 mm long steel bars. 4. Insert two steel bars of 16mm diameter and 150mm long in a row on the table at 150mm to 200mm apart. 5. Insert another piece of steel at a distance of diameter of the bar of bending. 6. Put the bending bar in between the row of inserted bars and the bar by placing bar bending key's groove on the bar and turn slowly to 180^0 to give U bend without producing cracks on the bent bar. 7. Insert the fourth piece of steel bar at angle of 45^0 from the outer inserted bar of the two bars inserted in a row. 8. Insert the fifth piece of bar at right angle to the outer inserted bar of the two inserted bar in row. 9. Control the degrees of bend fro 45^0 and 90^0 from the above inserted pieces of bar described in 8 and 9 respectively. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop, necessary tools equipment and material including drawing **Task (What):** Bend re-bar (90^0, 45^0 U-bar). **Standard (How well):** All the steps followed in sequence. Re-bar bent at 90^0, 45^0 and U position.	➢ Bending length (concept only) ➢ Procedure ➢ Safety precautions

Required tools/equipment: hammer, cutter and bar bending key
Safety: Wear safety boot and safety gloves.

Module Code: M 0
Sub module Code: SM 0.2
Sub module Title: Basic English

Description

This course is designed for the development of English language skills in reading, writing and speaking for the trainees who involve in vocational as well as technical occupation. The focus of this sub module is to improve the conversational, comprehensive and written skills needed for their day to day life.

Duration: 30 hours

S.No.	Descriptions	Time (hours)
1	Orient with: ♦ Noun ♦ Verb ♦ Adjective ♦ Adverb	2
2	Apply auxiliary and main verbs	1
3	Orient with tense and sentence structure: ♦ Simple past / past continuous (when) ♦ Present perfect / simple past ♦ Past perfect / simple past ♦ Present perfect / continuous ♦ Future perfect / continuous ♦ "Going to" future / uses	4
4	Orient with affirmative / Negative sentences	2
5	Apply Yes / No question	2
6	Apply Wh- question	2
7	Read/ Write memos	1
8	Read, understand and use the technical terms in their sentences (with emphasis on trade related terminology).	2
9	Read short related publications/ national news papers like Himalayan, Kathmandu Post…..	2
10	Read and follow English language instruction.	2
11	Improve listening skills through participating in conversational	2

	programs between two persons or among the groups	
12	Explain related objects, drawing and projects, graphs, visuals by both written and speaking methods	2
13	Participate on debate programs which are related to the training and advocate for the motion and also against the motion	2
14	Write dairy, notes	2
15	Develop the spoken competencies required to apply for employment during the stage of Visa application to work station in abroad	2
	Total	**30**

Module Code: M 0
Sub module Code: SM 0.3
Sub module Title: Basic Mathematics

Description
This course is designed to equip trainees with the knowledge and skills on Basic Mathematics as a prerequisite course for mastering any specific module/s. This course deals with mathematical skills such as unit conversion, fraction, measurement, simple geometric concept, volume and quantity calculation, cost calculation as well as other calculations related to their occupation.

Duration: 30 hours

Competencies in Basic Mathematics

S. No.	Task statements	Time (hrs.)
1	Convert unit of measurement from one system to another system	2
2	Measure length, breadth and height of the object /geometrical figure	2
3	Calculate perimeter of the geometrical figures (triangle, square, rectangle, circle, polygon)	2
4	Calculate area (rectangle, circle, trapezoid, triangle etc)	2
5	Measure mass/density/weight/capacity/Volume of solid and liquid	3
6	Calculate the quantity of materials required	5
7	Measure the quantity of work performed	5
8	Calculate the total cost of work performed	3
9	Calculate gradient.	1
10	Apply 3, 4, 5 Method	3
11	Apply simple unitary rule.	2
Total		**30**

Module Code: M 0
Sub module Code: SM 0.4

Sub module Title: Basic Drawing

Description

This sub module is designed to equip trainees with the knowledge and skills on Basic Drawing as a prerequisite course for mastering any specific module/s. The course deals with the fundamental concept of drawing, general drawings skills as well as interpreting skills related to the occupation.

Duration: 80 hours

Competencies in Basic Drawing

1. Identify/handle/apply drawing instruments/materials
2. Perform layout of drawing sheet.
3. Draw different types of lines.
4. Print Roman / Devnagari letters in drawing.
5. Apply principles of dimensioning.
6. Make freehand sketch of various geometrical objects
7. Draw the object in appropriate scale.
8. Draw plan, elevation, side views and cross section of the given object.
9. Apply different symbols and sign conventions (hatching) in the drawing.
10. Read /draw wiring diagram, Connection Board diagram, Plumbing line diagram, Z-dimension diagram.
11. Design a wiring system for a residential and outdoor wiring (drawing).
12. Draw schematic drawing
13. Draw connection diagram.
14. Read bar schedule and spacing.
15. Interpret plumbing/scaffolding.

Task Analysis

Task No: 1. Identify/handle/apply drawing instruments/materials.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect drawing instruments and materials. 2. Identify drawing instruments and materials. 3. Handle drawing board. 4. Handle/apply set-square. 5. Handle/apply T-square. 6. Handle instrument box. 7. Handle/apply scale. 8. Handle/apply protector. 9. Handle/apply French curve 10. Handle/apply drawing pencil 11. Handle sand -paper block. 12. Restore instruments and materials. 13. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Identify/handle/apply drawing instruments/materials. **Standard (How Well)** Drawing instruments and materials identified, handled and applied.	• Introduction of drawing instruments and materials • Various drawing instruments and materials and their uses. • Procedure

Required tools/ equipment: All the drawing instruments
Safety:

Task Analysis

Time : 4 hrs
Theory : 2 hrs
Practical: 2 hrs

Task No: 2. Perform layout of drawing sheet.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect all required tools and materials for drawing. 2. Place the drawing paper on the drawing board. 3. Plan space in the drawing paper. 4. Perform layout before drawing. 5. Draw the object according to the layout. 6. Clean the drawing. 7. Remove drawing sheet from board. 8. Restore instruments and materials. 9. Keep records.	**Condition (Given):** Drawing room, necessary drawing instrument and materials **Task (What):** Perform layout of drawing sheet. **Standard (How well):** All the steps followed in sequence. All lines drawn clean and clearly All the drawings well lay out.	➢ Overview of engineering /technical drawing ➢ Drawing tools, instruments and materials ➢ Standard size of drawing paper ➢ Concept of lines, points and dashes ➢ Different types of layout ➢ Title block of drawing

Required tools/equipment: Drawing tools, object, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Task No: 3. Draw different types of lines.

Time : 5 hrs
Theory : 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect all required tools and materials for drawing. 2. Place the drawing paper on the drawing board. 3. Plan space in the drawing paper for different types of lines to be drawn. 4. Draw different types of lines (Horizontal lines, vertical lines, diagonal lines, straight lines, curve lines, hidden lines, object lines, construction lines, hatching lines etc). 5. Clean the drawing. 6. Remove drawing sheet from board. 7. Restore instruments and materials. 8. Keep records.	**Condition (Given):** Drawing room, necessary drawing instrument and materials **Task (What):** Draw different types of lines (Horizontal lines, vertical lines, diagonal lines, straight lines, curve lines, hidden lines, object lines, construction lines, hatching lines etc). **Standard (How well):** All the steps followed in sequence. All lines drawn clean and clearly All lines drawn in one sheet of drawing paper.	➢ Concept of points and lines ➢ Types of lines and their appropriate area of use ➢ Importance of hidden lines, object lines, construction lines and hatching lines.

Required tools/equipment: Drawing tools, object, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Task No: 4. Script Roman / Devnagari letters in drawing.

Time : 6 hrs
Theory: 1 hr
Practical: 5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect all required tools and materials for drawing. 2. Place the drawing paper on the drawing board. 3. Plan space in the drawing paper for different types of letters to be drawn. 4. Select the size of the letters 5. Draw guideline. 6. Script roman/devanagari letters according to the given sample /assignment. 7. Repeat three four times step #6 for more practice until your lines match the given sample/assignment. 8. Clean the drawing. 9. Remove drawing sheet from board. 10. Restore instruments and materials. 11. Keep records.	**Condition (Given):** Drawing room, necessary drawing instrument and materials **Task (What):** Script roman/devnagari letters in drawing. **Standard (How well):** All the steps followed in sequence. Letters matched with the given assignment. Letters inclined to the horizontal plane with $75^0/90^0$. Uniform colour and thickness of letter maintained.	➢ Drawing letters ➢ Angle of drawing letters (75^0, 90^0) ➢ Guidelines

Required tools/equipment: Drawing paper, T-square, set square, pencil (2H, B, HB, 2B), eraser, drawing board scale

Safety:

Task Analysis

Time : 4 hrs
Theory : 1 hr
Practical: 3 hrs

Task No: 5. Apply principles of dimensioning.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect all required tools and materials for drawing. 2. Place the drawing paper on the drawing board. 3. Plan space in the drawing paper for different type's letters to be drawn. 4. Select the size of the letters 5. Draw guideline. 6. Print roman/devanagari letters according to the given sample /assignment. 7. Repeat three four times step #6 for more practice until your lines match the given sample/assignment. 8. Clean the drawing. 9. Remove drawing sheet from board. 10. Restore instruments and materials. 11. Keep records.	**Condition (Given):** Drawing room, necessary drawing instrument and materials **Task (What):** Apply principles of dimensioning. **Standard (How well):** All the steps followed in sequence. Letters matched with the standard dimension. Letters maintained clean and clear. Letters inclined to the horizontal plane with $750/90^0$. Letters are of uniform colour and thickness.	➢ Importance of Dimensioning in drawing ➢ Standard dimensioning techniques ➢ Standard size and style of dimensioning

Required tools/equipment: Drawing paper, T-square, set square, pencil (2H, B, HB, 2B), eraser, drawing board scale

Safety:

Task Analysis

Task No: 6. Make freehand sketch of various geometrical objects.

Time : 4 hrs
Theory : 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect all required tools and materials for sketching. 2. Place the drawing paper on the drawing board. 3. Obtain the geometrical object or assignment from your teacher. 4. Sketch the corresponding horizontal, vertical and diagonal lines in proportion with the real object on the drawing paper. 5. Join the corresponding points to complete the sketch. 6. Clean the drawing. 7. Remove drawing sheet from board. 8. Restore instruments and materials. 9. Keep records.	**Condition (Given):** Drawing room/ classroom, drawing instruments & materials and other various types of geometrical objects (square, circle, cylinder, cube, cone pyramid etc.) **Task (What):** Make free hand sketch of various geometrical objects. **Standard (How well):** All the steps followed in sequence. Sketched shape and given object shape matched with each other The drawn sketches and the size of the object maintained in proportion Drawn sketches maintained clean and clear.	➢ Overview of sketching ➢ Introduction to different kinds of lines (Horizontal lines, vertical lines, diagonal lines, straight lines, curve lines, hidden lines, object lines, construction lines, hatching lines etc)

Required tools/equipment: Drawing tools, object, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Task No: 7. Draw the object in appropriate scale.

Time : 7 hrs
Theory : 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect all required tools and materials. 2. Measure length, breadth and height and other necessary parts of the object. 3. Decide the scale according to the drawing paper and size of the object. 4. Convert measured length, breadth and height into the decided scale. 5. Draw the object according to the scale. 6. Give dimensions. 7. Complete the drawing. 8. Clean the drawing. 9. Remove drawing sheet from board. 10. Restore instruments and materials. 11. Keep records.	**Condition (Given):** Real object and drawing instrument & materials **Task (What):** Draw the object in appropriate scale. **Standard (How well):** All the steps followed in sequence. The dimensions given to the object agreed with the real size of the object.	➢ Definition of scale ➢ Types of scale, (Reduced scale and enlarged scale) ➢ Use of scale in drawing

Required tools/equipment: Drawing tools, object, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Task No: 8. Draw plan, elevation, side views and cross section of the given object.

Time : 13 hrs
Theory : 1 hr
Practical: 11 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect all required tools and materials. 2. Measure length, breadth and height and other necessary parts of the object. 3. Decide the standard scale according to the drawing paper and size of the object. 4. Convert measured length, breadth and height into the standard scale. 5. Draw plan, elevation and side views of the given object according to the scale. 6. Give corresponding dimensions. 7. Complete the drawing. 8. Clean the drawing. 9. Remove drawing sheet from board. 10. Restore instruments and materials. 11. Keep records.	**Condition (Given):** Real object (cone, pyramid etc.) and drawing instrument & materials **Task (What):** Draw plan, elevation, side views and cross section of the given object. **Standard (How well):** All the steps followed in sequence. The dimensions given agreed with the real size of the object. Plan Elevation and side views and cross section drawn on the standard scale.	➢ Orthographic projection of the object ➢ Definition of Plan, elevation, side views and cross section ➢ Interpretation of plan elevation, side views and cross section of the object ➢ Sign, symbols and hatching in drawing

Required tools/equipment: Drawing tools, object (cone, pyramid etc), pencil, eraser, sharpener etc.

Safety:

Task Analysis

Time : 6 hrs
Theory : 1 hr
Practical: 5 hrs

Task No: 9. Apply different symbols and sign conventions (hatching) in the drawing.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect drawing materials and assignment. 2. Draw the plan, elevation and section as per requirement of the assignment. 3. Use standard symbols and sign conventions in the drawing. 4. Clean the drawing. 5. Remove drawing sheet from board. 6. Restore instruments and materials. 7. Keep records.	**Condition (Given):** Drawing (house wiring, building construction and plumbing) and drawing instrument & materials **Task (What):** Apply different symbols and sign conventions (hatching) in the drawing. **Standard (How well):** All the steps followed in sequence. IS standard sign conventions and symbols applied Respective sign conventions and symbols (house wiring, plumbing and building construction) used in the respective drawings.	➢ Different types of sign conventions and symbols used in Plumbing, house wiring and building construction ➢ Importance of signs and symbols in drawing

Required tools/equipment: Drawing tools, IS standard sign and symbol chart, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Time : 11 hrs

Task No: 10. **Read /draw wiring diagram, Connection Board diagram, Plumbing line diagram, Z-dimension diagram.**

Theory : 3 hrs

Practical: 8 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect drawing materials and assignment. 2. Draw/read layout of the drawing 3. Draw /read the wiring diagram, connection Board diagram, plumbing line diagram, Z-dimension diagram etc. 4. Clean the drawing. 5. Remove drawing sheet from board. 6. Restore instruments and materials. 7. Keep records.	**Condition (Given):** Drawing room, necessary instrument and materials with drawing **Task (What):** Read /draw wiring diagram, Connection Board diagram, Plumbing line diagram, Z-dimension diagram. **Standard (How well):** All the steps followed in sequence. Wiring, connection board diagram, plumbing line diagram and Z-dimension diagram drawn with the standard signs and symbols. All diagrams meet the requirement of the assignment.	➢ Definition of wiring diagram, connection board diagram, plumbing line diagram, Z-dimension diagram ➢ Use of standard signs and symbols ➢ Use of wiring diagram, connection board diagram, plumbing line diagram, Z-dimension diagram ➢ Importance of wiring diagram, connection board diagram, plumbing line diagram, Z-dimension diagram

Required tools/equipment: Assignment, drawing tools, IS standard sign and symbol chart, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Time : 7 hrs
Theory : 1 hr
Practical: 6 hrs

Task No: 11. Design a wiring system for a residential and outdoor wiring (drawing).

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect drawing materials and assignment. 2. Read/Interpret the plan of the building. 3. Design a wiring system for a residential and outdoor wiring diagram. 4. Apply the standard sign and symbols. 5. Clean the drawing. 6. Remove drawing sheet from board. 7. Restore instruments and materials. 8. Keep records.	**Condition (Given):** Drawing room, necessary instrument and materials with building drawing **Task (What):** Design a wiring system for a residential and outdoor wiring (drawing). **Standard (How well):** All the steps followed in sequence. Design matched with the requirement provided.	➢ Wiring system ➢ Design technique ➢ Standard sign and symbols

Required tools/equipment: Assignment, drawing tools, IS standard sign and symbol chart, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Task No: 12. Draw schematic drawing.

Time : 4 hrs
Theory : 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect drawing materials and assignment. 2. Decide the schemata to be drawn 3. Draw schematic drawing. 4. Apply the standard sign and symbols. 5. Clean the drawing. 6. Remove drawing sheet from board. 7. Restore instruments and materials. 8. Keep records.	**Condition (Given):** Drawing room, necessary instrument and materials **Task (What):** Draw schematic drawing. **Standard (How well):** All the steps followed in sequence. Schematic drawing matched with the requirement provided.	➢ Definition of schematic drawing ➢ Types and use of schematic drawing

Required tools/equipment: Assignment, drawing tools, IS standard sign and symbol chart, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Task No: 13. Draw connection diagram.

Time : 4 hrs
Theory : 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect drawing materials and assignment. 2. Decide the connection to be drawn. 3. Draw connection diagram. 4. Apply the standard sign and symbols. 5. Clean the drawing. 6. Remove drawing sheet from board. 7. Restore instruments and materials. 8. Keep records.	**Condition (Given):** Drawing room, necessary instrument and materials **Task (What):** Draw connection diagram. **Standard (How well):** All the steps followed in sequence. Connection diagram matched with the requirement provided.	➢ Definition of connection diagram ➢ Types and use of connection diagram

Required tools/equipment: Assignment, Drawing tools, IS standard sign and symbol chart, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Task No: 14. Read bar schedule and spacing.

Time : 3 hrs
Theory: 1hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect bar schedule and bar drawing. 2. Identify the different types of bar from the bar schedule. 3. Identify the size and shape of the bar. 4. Identify the spacing of the bar 5. Fill out the bar size, shape and spacing of corresponding reinforcement in the respective columns of the bar schedule. 6. Keep records.	**Condition (Given):** Bar schedule format (blank) and drawing **Task (What):** Read bar schedule and spacing. **Standard (How well):** All the steps followed in sequence. Size, shape and spacing of corresponding reinforcement filled in the respective columns of the bar schedule.	➢ Bar schedule format ➢ Reinforcement size and shape ➢ Calculation of reinforcement

Required tools/equipment: Bar schedule format, drawing tools, pencil, eraser, sharpener etc.

Safety:

Task Analysis

Task No: 15. Interpret plumbing/scaffolding drawing.

Time : 3 hrs
Theory : 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect plumbing and scaffolding drawing. 2. Identify elements and parts of plumbing and scaffolding. 3. Interpret plumbing/scaffolding drawing. 4. Explain the elements of the plumbing and scaffolding.	**Condition (Given):** Plumbing and scaffolding drawing **Task (What):** Interpret plumbing/scaffolding drawing. **Standard (How well):** All the steps followed in sequence. Elements and parts of plumbing and scaffolding well interpreted.	➢ Plumbing and scaffolding ➢ Types of scaffolding ➢ Different elements of plumbing and scaffolding

Required tools/equipment: Plumbing and scaffolding drawing, format, drawing tools, pencil, eraser, sharpener etc.

Safety:

Module Code: M 0

Sub Module Code: SM 0.5

Sub module Title: Entrepreneurship Development

Description
This sub module is designed to equip the trainees with knowledge and skills on Entrepreneurship Development. The course deals with various entrepreneur competencies, project identification, enterprise management, marketing skills, promotional activities, and business scheme preparation and communication skills needed for their occupation.

Duration: 20 hours

Competencies in Entrepreneur Development

1. Develop entrepreneurial competencies.
2. Select / identify a project.
3. Prepare a business scheme.
4. Develop marketing skill.
5. Conduct promotional activities.
6. Apply communication skills.
7. Manage an enterprise.

Task Analysis

Task No: 1 Develop entrepreneurial competencies.

Time: 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Observe the surrounding environment and entrepreneur own capabilities. 2. Develop entrepreneur own capabilities. 3. Take steps for achievement of - economic objective. - social objective. - human objective. 4. Prepare business plans based on ones own findings. 5. Develop new profitable business opportunities by combining resources in a new way. 6. Produce marketable products. 7. Create markets. 8. Innovate and develop improved 9. technologies. 10. Inspire others. 11. Supply quality goods. 12. Reduce cost for reducing price of product. 13. Provide employment. 14. Utilize the scarce resource properly. 15. Avoid social nuisances. 16. Manage financial problem. 17. Develop management skill for all business activities - production, inventory, purchasing, marketing, research and development, financial and personnel. 18. Satisfy employees / consumers / partners. 19. Be dynamic, risk taking according to the situation. 20. Be perfect decision maker. 21. Develop confidence.	**Condition(Given):** Classroom and reading materials **Task (What):** Develop entrepreneurial competencies. **Standard (How well):** All the steps followed in sequence. Entrepreneurial competencies well developed	➢ Introduction to Entrepreneurship ➢ Traits of an entrepreneur ➢ Concept of employment ➢ Concept of business ➢ Entrepreneurial competencies ➢ Managerial skill

Tools/equipment:

Safety:

Task Analysis

Task No: 2 Select / identify a project.

Time: 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Make list of projects. 2. Classify the projects in group according to - personal interest / ability. - possibility of earning profit. - less risk. - knowledge and skill needed. - estimated size and available resources. - prevailing level of competition. - chance of expansion in future. - level of competition. - rising trend of future demand. - duration. 3. Investigate the projects. 4. Determine - form of business. - provision of capital. - location. - available staffs according to the project. - office equipment. - government policy. 5. Prioritize the projects regarding - strength, weakness, opportunity, threat. 6. Select right project according to your vision and mission.	**Condition(Given):** Site and reading materials **Task (What):** Select / identify a project. **Standard (How well):** All the steps followed in sequence. A project selected and identified meeting the requirements.	➢ Concept of business ➢ Introduction to SWOT (Strength, weakness, opportunity and threat) ➢ Tips for opportunity selection ➢ Reason of business failure ➢ Requisites of business success ➢ Project selection criteria

Tools/equipment:

Safety:

Task Analysis

Task No: 3 Prepare a business scheme.

Time: 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Identify the project standard regarding - functional. - technical. - aesthetic. - capital cost. - life cycle cost. 2. Specify the objective of the project. 3. Analyze net working by critical path method - state the master activities of the project. - evaluate whole activities. - set up the sequence of activities. - allocate the time / duration for each activity. - study about the cost of activities (labour / material / tools cost). - Prepare tabulation (sequence activities with time). - apply project evaluation and review technique. 4. Analyze production - prepare resource and multi project schedule. - state required men, machine, and materials for each production activities. - give specification of resources. - determine time schedule for each activities. 5. Analyze finance - by undiscounted method ▪ calculate simple rate of return on investment. ▪ calculate payback period. - by discounted method ▪ calculate net present value. ▪ internal rate of return. ▪ benefit cost ratio. 6. Develop financial plan - indicate funds need by form for the specified period. - indicate timing of inflows and outflows. - indicate sources. - indicate use of funds for project activities. - forecast to determine the specific amounts and timing of expenditure and receipts. - follow the profit and loss account.	**Condition(Given):** Reading materials and field visit report **Task (What):** Prepare a business scheme. **Standard (How well):** All the steps followed in sequence. Business scheme prepared according to the guidelines.	➢ Concept and importance of business plan / scheme ➢ Guideline for preparing a business plan ➢ Production planning ➢ Expenses ➢ Financial analysis ➢ Profit and loss account

Task Analysis

Task No: 4 Develop marketing skills.

Time: 3 hrs
Theory: 2 hrs
Practical: 1hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set the objectives to be achieved. 2. Analyze the market to increase sales volume. 3. Formulate the sales budget. 4. Evaluate the potential customer's needs and wants. 5. Determine marketing plans, procedures and policies to serve the customers demand. 6. Interlink demand with supply. 7. Co-ordinate between the different constituent elements of the marketing mix - product. - price. - place. - promotion. 8. Select effective marketing channel. 9. Develop effective and smooth marketing communication. 10. Apply market research. 11. Co-ordinate and control all marketing activities. 12. Evaluate performance of sales force periodically. 13. Review all plans and policies and change if necessary. 14. Motivate the employees properly. 15. Plan and develop product to match - demand of the customer. - product life cycle. 16. Observe and study buyer's behaviors and their grievances. 17. Select effective distribution channels.	**Condition(Given):** Products, market, customer and reading materials **Task (What):** Develop marketing skill. **Standard (How well):** All the steps followed in sequence. Marketing skills well developed.	➢ Introduction to market and marketing ➢ Concept on demand and supply ➢ Types of market (on the basis of region) ➢ Introduction to marketing mix ➢ Introduction to product life cycle ➢ Buyers' behavior and its characteristics

Tools/equipment:

Safety:

Task Analysis

Task No: 5 Conduct promotional activities.

Time: 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select promotion mix as advertising according to - promotion objectives. - nature of the product. - nature of the target market. - stage of product life cycle. - size of the promotion budget. - promotion strategy. 2. Identify target audience. 3. Select objective regarding - informative. - persuasive. - reminding. - reinforcing. 4. Make decision for the budget. 5. Choose the message. 6. Liaison with the advertising agency. 7. Supervise advertising and marketing research. 8. Select the media - print media. - visual media. - audio media. - audio visual media. 9. Keep in touch with representatives of important media. 10. Cooperate with the sales and other departments. 11. Distribute advertising material. 12. Administration. 13. Evaluate impact.	**Condition(Given):** Products, market, customers, and reading materials **Task (What):** Conduct promotional activities. **Standard (How well):** All the steps followed in sequence. Promotional activities conducted.	➢ Concept of promotion ➢ Communication model ➢ Concept of advertisement ➢ Purpose of advertising ➢ Advertising media ➢ Features of advertising

Tools/equipment:

Safety:

Task Analysis

Task No: 6 Apply communication skills.

Time: 2 hrs
Theory: 2 hrs
Practical: hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Determine the receiver to whom to communicate. 2. Specify the objective of communicating. 3. Select appropriate channel of 4. Communication (downward, upward, broadcast horizontal, grape-vine and committee). 5. Solve the barriers in communication. 6. Design the contents according to the receiver - role of receiver. - history leading to communication. 7. Apply suitable method of communication. 8. Apply suitable language. 9. Listen and understand the feelings of receiver. 10. Clarify the communication. 11. Apply appropriate media.	**Condition(Given):** Enterprises and communication media **Task (What):** Apply communication skills. **Standard (How well):** All the steps followed in sequence. Communication skills well applied.	➢ Concept and importance of communication ➢ Elements of communication ➢ Types of communication (oral and written, formal and informal, upward, downward and horizontal) ➢ Barriers to communication ➢ Means of communication ➢ Listening technique ➢ Communication process

Tools/equipment:

Safety:

Task Analysis

Task No: 7 Manage an enterprise.

Time: 3 hrs
Theory: 3 hrs
Practical: hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Establish and regulate industry / business by - selection of business / business form. - investigation and research. - select location, office equipment. - manage capital. - study of legal formalities. 2. Follow all management process to achieve goal of an enterprise. 3. Apply planning process - determine the objectives. - formulate policies, procedure, programs, strategies and standard. - develop scheduling. - develop budgeting. 4. Apply organizing process - division of work. - placement of personnel into jobs. - establishing relationships. - delegation and decentralization of authority. 5. Apply staffing process - determine manpower requirements. - recruit, select, and train the personnel. - promote and transfer the personnel. 6. Co-ordinate in efficient organization of work within a team by - leading. - communicating. - motivating. 7. Apply horizontal, vertical, external internal, diagonal co-ordination. 8. Apply controlling process - establish standard of performance for office work. - measurement of actual performance. - compare actual performance with standard.	**Condition(Given):** Enterprises and reading materials **Task (What):** Manage an enterprise. **Standard (How well):** All the steps followed in sequence. Enterprises well managed.	➢ Establishment and regulation of business / industry ➢ Concept of management ➢ Role of management ➢ Managerial functions (planning, organizing, co-ordination and controlling) ➢ Method of planning ➢ Co-ordination in operating business

Tools/equipment:

Safety:

Module Code: M 0
Sub module Code: SM 0.6
Sub module Title: Generic Skills

Description

This sub module is designed to equip trainees with the knowledge and skills on Generic Skills as a prerequisite course for mastering any specific module/s. The course deals with the life skills needed to survive and adopt any change situation. Similarly, the trainees can cope with the existing environment and technology related to their occupation. ***The focus of this package is to develop trainees to maintain personal hygiene, develop personality, enrich with marketing skills and orient towards self-employment. Similarly, the trainees are to be prepared and educated for about worker traits and occupational code of conducts.***

Duration: 20 + 5 hours

Competencies in Generic Skills

1. Explain the importance of self awareness.
2. Write application for leave, visa, citizenship etc.
3. Read tender document, notice, vacancy advertisement etc.
4. Keep records of materials, inventory.
5. Maintain attendance, muster roll.
6. Study prevailing rules, regulation, bye laws work ethics.
7. Develop bio-data.
8. Develop interpersonal skill with family, friends and members of organization
9. Make effective decision.
10. Solve simple problems.
11. Set personal goal for yourself.
12. Treat others the way you want to be treated.
13. Explain the process of airport proceedings.

Task Analysis

Task No: 1 Explain the importance of self awareness.

Time: 1 hr.
Theory: 1 hr.
Practical: hrs.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instruction. 2. Define self awareness. 3. Discuss importance of self awareness. 4. Enlist zest of discussion.	**Condition (Given):** Reading materials **Task (What):** Explain the importance of self awareness. **Standard (How well):** Importance of self awareness explained.	➢ Definition of awareness ➢ Importance self awareness

Tools/equipment:

Safety:

Task Analysis

Task No: 2 Write applications for leave, visa, citizenship etc.

Time: 2 hrs
Theory: 1 hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Select one situation which requires application. 2. Take A4 size paper. 3. write application (make sure all components of an application are considered) 4. Make sure that main body agrees with the given situation. 5. Submit to the concerned body.	**Condition (Given):** Different simulation situations which requires application **Task (What):** Write application for leave, visa, citizenship etc. **Standard (How well):** Application is in A4 format written. The task steps followed in sequence.	➢ Definition of application ➢ Reasons for writing application ➢ Different conditions for writing application (for visa, citizenship, leave etc) ➢ Format for application ➢ Main components of application

Tools/equipment:

Safety:

Task Analysis

Task No: 3 Read tender document, notice, vacancy advertisement.

Time: 2 hrs
Theory: 1 hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect different types of news paper. 2. Select tender notice, general notice and vacancy advertisement. 3. Read tender document, notice and vacancy advertisement. 4. Explain the general contents of tender document, notice and vacancy advertisement.	**Condition (Given):** Tender documents, notices, vacancy advertisements and different newspapers. **Task (What):** Read tender document, notice, vacancy advertisement etc. **Standard (How well):** Tender document, notice and vacancy advertisement interpreted.	➢ Definition of tender document, notice, advertisement ➢ Importance of tender documents, notice and vacancy advertisement

Tools/equipment:

Safety:

Task Analysis

Task No: 4 Keep records of materials, inventory.

Time: 2 hrs
Theory: 1hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect list of different materials. 2. Register purchase quantity, issued quantity, damage, wear and tear quantity etc. 3. Calculate remaining quantity of different materials. 4. Verify the quantity with the stock quantity in the store. 5. Keep records.	**Condition (Given):** List of different materials (Purchase quantity, issued quantity, damage, wear and tear quantity etc) **Task (What):** Keep records of materials, inventory. **Standard (How well):** All the steps followed in sequence.	➢ Definition of Inventory ➢ Process for keeping inventory ➢ Inventory forms and formats

Tools/equipment:

Safety:

Task Analysis

Task No: 5 Maintain attendance, muster roll.

Time: 2 hrs
Theory: 1 hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect the name list of the people working in the project. 2. Perform day to day attendance. 3. Prepare muster roll. 4. Verify attendance of muster roll with the attendance sheet. 5. Keep records.	**Condition (Given):** Simulation situation (Name of the people working in certain project). **Task (What):** Maintain attendance, muster roll. **Standard (How well):** Attendance sheet checked. Attendance of muster roll with the attendance sheet verified.	➢ Definition of attendance and muster roll ➢ Advantages of attendance and muster roll ➢ Procedure

Tools/equipment:

Safety:

Task Analysis

Task No: 6 Study prevailing rules, regulation, bye laws, work ethics.

Time: 2 hrs
Theory: 1 hrs.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect bye laws, rules regulation documents, code of conduct etc. 2. Study the documents. 3. List the main rules and regulation. 4. Keep records.	**Condition (Given):** Prevailing rules, regulations, bye laws, code of conduct **Task (What):** Study prevailing rules, regulation, by laws work ethics **Standard (How well):** Important points of rules and regulations, bye laws listed out.	➢ Definition of laws, rules and regulations, bye laws, code of conduct and work ethics ➢ Importance of bye laws, code of conduct and work ethics

Tools/equipment:

Safety:

Task Analysis

Task No: 7 Develop bio-data.

Time: 2 hrs
Theory: 1 hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect detail information of the person. 2. Keep the information into different headings. 3. Develop bio-data in A4 size paper. 4. Make sure no information is missed. 5. Sign the bio-data 6. Keep records.	**Condition (Given):** Detail information of the person **Task (What):** Develop bio-data. **Standard (How well):** Bio-data is in A4 format with following contents developed. Full Name Permanent Address Date of birth Educational Qualification Experience Language Signature	➢ Definition Bio-data ➢ Points, that should be considered in bio-data ➢ Advantages of bio data ➢ Procedure for reorganizing information in bio-data

Tools/equipment:

Safety:

Task Analysis

Task No: 8 Develop interpersonal skill with family, friends and members of organization.

Time: 2 hrs
Theory: 1 hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instruction. 2. Select the people with different behavior. 3. Provide role for each person. 4. Discuss on the given topic. 5. Note down the words used for developing good relationships between them 6. End the discussion. 7. Enlist the interpersonal relationship of each person.	**Condition (Given):** Different people with different behavior **Task (What):** Develop interpersonal skill with family, friends and members of organization. **Standard (How well):** Interpersonal skill with family, friends and members of organization developed.	➢ Definition of good relationship ➢ Relationship with your family, friends and members of your organization ➢ Advantages of Good relationship ➢ Tips for making good relationship

Tools/equipment:

Safety:

Task Analysis

Task No: 9 Make effective decision.

Time: 2 hrs
Theory: 1 hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instruction. 2. State the issue. 3. Conduct discussion on the issue for 5-10 minutes. 4. Note the pros and cons of the issue raised in the discussion. 5. Make decision using win-win strategy 6. Disseminate the decisions.	**Condition (Given):** Simulated debatable issues **Task (What):** Make effective decision. **Standard (How well):** Decision made on the win/win strategy.	➢ Definition of decision ➢ Situations and circumstances for effective decision ➢ Advantages of effective decision ➢ Process for making decision

Tools/equipment:

Safety:

Task Analysis

Task No: 10 Solve simple problem.

Time: 2 hrs
Theory: 1 hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instruction. 2. Select the person with simple problem. 3. Orient with the problem. 4. Find different alternatives of solutions. 5. List merits and demerits of each solution. 6. Select the best solution. 7. Implement the solution. 8. Receive the feedback.	**Condition (Given):** Person with a simple problem related to the life **Task (What):** Solve simple problem. **Standard (How well):** Alternatives of solutions identified. Person satisfied with the solutions.	➢ Definition of problem ➢ Types of problem ➢ Problem solving process ➢ Different types of solutions ➢ Merits and demerits of each alternative solutions ➢ Win/win strategy ➢ Principles of persuasion

Tools/equipment:

Safety:

Task Analysis

Task No: 11 Set personal goal for you .

Time: 2 hrs
Theory: 1 hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instruction. 2. Set clear vision of future. 3. Internalized the set goal. 4. Check if the goal is simple, clear and achievable. 5. List the strategies to achieve the goal.	**Condition (Given):** Person with clear vision of his future **Task (What):** Set personal goal for yourself. **Standard (How well):** Simple, clear and achievable goal set.	➢ Getting to know yourself ➢ Accepting yourself ➢ Setting personal goal for yourself ➢ Working/strategies to achieve the goal

Tools/equipment:

Safety:

Task Analysis

Task No: 12 Treat others the way you want to be treated.

Time: 2 hrs
Theory: 1 hr.
Practical: 1 hr.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instruction. 2. Prepare two persons. 3. Select the conversation topic. 4. Make them conversation on the topic for about 5 to 10 minutes. 5. Note if the person was happy with the way he was treated. 6. Change the role.	**Condition (Given):** Two persons **Task (What):** Treat others the way you want to be treated. **Standard (How well):** The person happy with the way he treated.	➢ Relation with family and friends ➢ Good and bad ways to treat others. ➢ Procedure for treating others

Tools/equipment:

Safety:

Task Analysis

Task No: 13 Explain the process of airport proceedings.

Time: 3 hrs
Theory: 1 hr.
Practical: 2 hrs.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare for departure/arrival. 2. Make sure the carries required documents (passport and ticket) 3. Check the baggage for security. 4. Confirm the departure time looking at the information board or TV. 5. Pay the airport tax. 6. Register the ticket and baggage 7. Collect the tags of the baggage. 8. Collect boarding pass. 9. Pass through security check. 10. Proceed to the plane. 11. Register name on the immigration of destination country. 12. Arrange the transport to reach work station.	**Condition (Given):** Simulated situation for departure / arrival **Task (What):** Explain the process of airport proceedings. **Standard (How well):** All the steps followed in sequence.	➢ Airport for visiting different countries ➢ Arrival and Departure ➢ Procedure for departure and arrival ➢ Registration ➢ Airport tax ➢ Boarding pass ➢ Lost and findings ➢ Baggage collection ➢ Immigration ➢ Security check

Tools/equipment:

Safety: Always receives passport from the points where it could be checked.

Module Code: M 1

Module Title: Masonry and Tile Fitting

Description
This module is designed to equip trainees with the knowledge and skills on masonry and tile fitting works. On masonry, it deals with stone masonry, brick masonry and hollow block masonry. However, the emphases are given to brick masonry. Similarly, on tile fitting it deals with bathroom tiling, kitchen tiling, passage and stair tiling both with glazing and non glazing tiling. The masonry and Tiling are treated here in facts, two separate sub modules.

Aim
This module aims to equip trainees with knowledge and skills based on the job required to be performed by a Mason and a Tile fitter in Nepal and abroad.

Objectives
After completion of this module the trainees will be able to:

1. Identify various types of construction materials.
2. Perform stone masonry work, bricks masonry work and hollow block work.
3. Identify various types of tiles those could be used in various spaces of building.
4. Perform bathroom tiling, kitchen tiling as well as passage and stair tiling laying works.

Prerequisite: Basic general module completed.

Duration: 660 hours (340 hours in house training and 320 hours OJT)

Module Structure (M 1)

S.N.	Code	Sub-modules	Nature	Total hours	Full marks
1	SM 1.1	Masonry	T+P	260	300
2	SM 1.2	Tile Fitting	T+P	80	
3		On the Job Training (2 months)	P	320	200
			Total	**660**	**500**

Module Code: M 1
Sub module Code: SM 1.1
Sub module Title: Masonry

Description

This sub module is designed to equip trainees with the knowledge and skills on masonry works related to building and other civil structures. The course deals with stone masonry, brick masonry and hollow block masonry as well as plastering skills. However, it is emphasized on brick masonry structures construction. Moreover, it also intends to provide knowledge and skills of rat trap bond walling technology as a separate part at the end of this sub module.

Duration: 260 hours (230 hrs plus Rat trap technology 30 hrs)

Competencies in Masonry

1. Identify commonly available building materials.
2. Identify tools required in masonry works.
3. Prepare cement sand (1:6) mortar.
4. Identify components of stone masonry (corner stone, through stone, fill-ins, dressed stones, non-dressed stones, quarry stones, stone sap, flag stones, sand stones, marble, etc).
5. Build a random rubble stone wall 2 meter long, 45cm thick and 75 cm high in 1:6 cement sand mortar with one end stopped and the other racked back.
6. Build a return coursed random stone wall 2m long 40cm thick and 90cm high in 1:6 cement sand mortar and point it with both ends stopped.
7. Build a return ashlars stonewall with dressed stones 1m X 2m long, 40cm thick and 1m high providing 1m long window opening from 60cm high in 2m limb, with both ends stopped.
8. Build a coursed random stonewall 35cm thick, 75cm high and 3m long including 45cm x 45cm stone pillars at both ends of 1m high.
9. Identify different bricks cuts.
10. Develop the concepts of brick bonding in wall.
11. Build a return wall ½ brick in stretcher bond 1.5 m long, 1m high with a rectangle opening at 60cm high.
12. Build 1 Brick thick Straight wall in English bond, 1m long and 75cm high with one end attached to a pillar (1.5 x 1.5 B) and the other raked back.
13. Build one brick thick return wall in English bond providing a rebate for a doorframe and BoE (Brick on Edge) sill for a window at 90cm, of size 2m x 1.5m long and 2m high.
14. Build one brick thick 1.5 m long straight wall in Flemish bond with 1m high and point it with a colorful stuff on both front and side faces.
15. Build one brick thick return wall of 2x1m long and 1m high in Flemish bond giving a window opening at 40cm with BoE sill.
16. Build a cross wall in one brick thick in English bond of 1 x1m long and 70cm high.

17. Build a cross wall in one brick thick Flemish bond of 1 x 1 m long and 70cm high.
18. Build 1.5B thick brick wall in English bond of 1.5 m long and 1m high covering brick capping and point all faces.
19. Build an arch of semicircular type of radius 60cm over a door opening with brick on header course.
20. Makes brick lintel for 1.2m wide window opening in a BoE pattern and build 30cm high wall.
21. Build a gable wall to fit a roof truss of span 3m and rise 90cm in English bond.
22. Build block wall with hollow blocks for 3m long and 2m high and rough castes.
23. Perform cement sand plastering work on floor/wall/ceiling.
24. Perform pointing with color cement sand stuff on masonry wall.
25. Prepare/laying/compacting/curing concrete 1:2:4 in a given place.

Task Analysis

Task No. 1. Identify commonly available building materials.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Explain the properties of building materials. 2. Specify commonly used building materials in Nepal. 3. Explain building units like stones, bricks, blocks, timber, bamboo, mud mortar, cement mortar, lime mortar. 4. Explain built units like substructure, super structure, roof covering, Plastering, color washing, water supply and sanitation, roads, irrigation, retaining walls. 5. Keep records.	**Condition (Given):** Workshop & building materials commonly used in Nepal. **Task (What):** Identify commonly available building materials. **Standard (How well):** Commonly used building materials identified.	➢ Introduction to building materials ➢ Various building materials used in Nepal ➢ Properties of building materials

Required tools/equipment: Notes, Handouts, building units like bricks, stones, timber etc.
Safety:

Task Analysis

Task No. 2. Identify tools required in masonry works.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. List of tools required for masonry works. - Trowel and its types, - Shovel, - Mixing board, - Line and pins, - Spirit level, - Float, - Hawk, - Pointer, - Hammer, - Brick hammer, - Bolster, - Gauge box, - Mallet, - Picks, - Pans /Basket, - Straight edge, - Pipe level, - Abney level, - Builder square 2. list the function of each tools 3. Take care and maintenance of the tools. 4. Keep records.	**Condition (Given):** Workshop and tools **Task (What):** Identify tools required in masonry works. **Standard (How well):** Tools required for masonry works identified.	➢ Introduction, use, and maintenance of tools used in masonry works

Required tools/equipment: All tools used in masonry works displaying on table
Safety:

Task Analysis

Time : 2 hrs
Theory : 1 hr
Practical: 1 hr

Task No. 3**. Prepare cement sand 1:6 mortar.**

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Inspects sand for making mortar. 2. Inspects water to be used for mixing cement and sand. 3. Inspects cement to be used for making mortar. 4. Inspect mixing platform. 5. Prepare batching box equal to volume of one bag of cement. 6. Use the batching box to batch sand at first four times with sand and place on the mixing board. 7. Unload cement from its bag on top of sand heap. 8. Put two more batch box of sand over the cement poured on the sand heap. 9. Dry mix by overturning three times until it become homogenous in color. 10. Make heap of the dry mix and make a ditch in the middle of the heap to hold water. 11. Add water slowly and keep the stuff overturning. 12. Continue overturning the stuff adding water until it become workable and uniform in color. 13. Pat the stud with trowel and draw back pressingly and if it looks fine and uniform it is well prepared mortar. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 16. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Prepare cement sand 1:6 mortar. **Standard (How well):** All the steps followed in sequence. Cement sand mortar in 1:6 prepared.	➢ Preparation of making mortar ➢ Batching, Mixing and preparing mortar ➢ Procedure ➢ Safety precaution

Required tools/equipment: Mixing board, Shovel, Trowel, Batching box, water bucket.
Safety: Wear safety boot.

Task Analysis

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Task No. 4. Identify components of stone masonry

(Corner stone, through stone, fill-ins, dressed stones, non-dressed stones, quarry stones, stone sap, flag stones, sand stones, marble).		
Performance Steps	**Terminal Performance Objective**	**Related Technical Knowledge**
1. Draw a stone masonry wall on the board and explain major components. 2. Distribute handouts containing drawing of stone masonry. 3. Draw an isometric drawing of a stone masonry and show corner stone. 4. Draw a sectional drawing of a stone masonry to show through stone and explain its function. 5. Show fill-ins and explain its use. 6. Draw stone faces of dressed stones of various dressing and explain them. 7. Clean all tools & equipment & put at proper place 8. Clean working place. 9. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Identify components of stone masonry. **Standard (How well):** All the steps followed in sequence. Components of stone masonry identified.	➢ Identification of various components in stone masonry ➢ Function of different components of stone masonry

Required tools/equipment:

Safety:

Task Analysis

Time : 10 hrs
Theory: 1 hr
Practical: 9 hrs

Task No. 5. Build a random rubble stone wall 2 meter long, 45cm thick and 75 cm high in 1:6 cement sand mortar with one end stopped and the other racked back.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select building stones of various sizes. 2. Select the place or site where to build 2m long random rubble stone masonry wall. 3. Mark the wall size on the ground to erect wall. 4. Prepare cement sand mortar 1:6 for making a random rubble stone wall. 5. Lay corner stones, large enough to guide other stones in the middle, at two meter distance. 6. Stretch line to guide flush face rather than course line. 7. Lay mortar and place intermediate stones of various sizes fitting in the gaps. 8. Put through stone one in every 1 Sqm. 9. Flush joints with trowel so that it looks nice. 10. Give finish to rear part of the wall, too. 11. Level top of the wall with stones to give finish. To the wall. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Build a random rubble stone wall 2 meter long, 45cm thick and 75 cm high in 1:6 cement sand mortar with one end stopped and the other racked back. **Standard (How well):** All the steps followed in sequence. A random rubble wall of 2m long 45cm thick and 75cm high built in 1:6 cement sand mortar.	➢ Types of stone masonry ➢ Selection of stones for building ➢ Preparation of mortar ➢ Dressing of through stones ➢ Finish and leveling. ➢ Procedure ➢ Safety precaution

Required tools/equipment: Club hammer, Tape, Trowel, Line and pins, mortar board, shovel, water bucket, chisel, pan.
Safety: Use safety boot.

Task Analysis

Time : 10 hrs
Theory: 1 hr
Practical: 9 hrs

Task No. 6. Build a return coursed random stone wall 2m x 1m long 40cm thick and 90 cm high both end stopped in 1:6 cement sand mortar and point it.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select site fro construction of random stone wall of 2m long. 2. Select stones for making the wall. 3. Prepare the ground for building the wall. 4. Lay out the position of wall on the ground using builder's square. 5. Prepare cement sand mortar 1:6 for the wall. 6. Lay end corner stones and return corner stone first. 7. Level and plumb the ends and corner. 8. Stretch line using line and pins from the end to the corner. 9. Fill the middle portion by building wall with stones. 10. Use the line to guide for course level and flush face. 11. Stretch line on the other limb of the wall from the corner to the end stone to give line and level of the course. 12. Build the wall in the middle. 13. Place corner stones for the second course and repeat the same process. 14. Point the face work in any pointing pattern- tuck, groove or flush. 15. Clean all tools & equipment & put at proper place 16. Clean working place. 17. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials . **Task (What):** Build a return coursed random stone wall 2m x 1m long 40cm thick and 90 cm high both end stopped in 1:6 cement sand mortar and point it. **Standard (How well):** All the steps followed in sequence. 2mx1m return coursed random stone wall of given size built.	➢ Lay out of right angle technique ➢ Leveling and plumbing ➢ Types of pointing ➢ Procedure ➢ Safety precaution

Required tools/equipment: Club hammer, trowel, line and pins, spirit level, plumb bob, mortar board, pan, measuring tape etc.
Safety: Use safety boot.

Task Analysis

Task No. 7. **Build return ashlars stone wall with dressed stones 1mx2m limbs, 40cm thick and 1 m high providing 1m window opening from 60cm high in 2m limb, both ends stopped.**

Time : 16 hrs
Theory: 1 hr
Practical: 15 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain various sizes of stones required for building wall. 2. Prepare the ground by leveling if it is undulated. 3. Lay out the position of wall on the ground using 3: 4: 5 methods and fixing window poison on the wall. 4. Select a corner stone with at least it has two face sides. 5. Lay mortar and place the selected corner stone facing outside to give line for flush face. 6. Lay mortar and place end stone that also give two finish face. 7. Stretch line and build the middle portion of the wall. 8. Build up to the height of 60cm and level window marked portion. 9. Build as usual the rebate of the window and the other portion of wall up to the required height. 10. Finish the face side of the wall by any method. 11. Keep all corners plumbed and vertical and level all horizontal finish. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Build return ashlars stone wall with dressed stones 1mx2m limbs, 40cm thick and 1 m high providing 1m window opening from 60cm high in 2m limb, both ends stopped. **Standard (How well):** All the steps followed in sequence. A returned ashlars wall with window opening of a given size built.	➢ Bonding in ashlars wall ➢ Window opening in wall ➢ Squaring by 3:4:5 methods ➢ Procedure ➢ Safety precaution

Required tools/equipment: Club hammer, trowel, line and pins, spirit level, plumb bob, mortar board, pan, measuring tape etc
Safety: use safety boot.

Task Analysis

Time : 13 hrs
Theory: 1 hr
Practical: 12 hrs

Task No. 8. Build a coursed random wall stonewall 35cm thick, 75cm high and 3m long with 45cmx45cm stone wall pillar of 1m high at both ends.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare building site. 2. Lay out the structure on the building site. 3. Prepare mortar. 4. Lay corner stones on end pillars and build pillars. 5. Lay stones on the line for the middle wall. 6. Use line and pins to fill in the middle of the wall in between the pillars. 7. Bond the wall and the pillar well. 8. Provide through stone in the wall where and when required. 9. Plumb all corners of both pillars. 10. Build the pillar up to 1 m high beyond the wall by 25cm. 11. Finish the wall at 75cm high. 12. Flush point the pillars and wall. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Build a coursed random wall stonewall 35cm thick, 75cm high and 3m long with 45cmx45cm stone wall pillar of 1m high at both ends. **Standard (How well):** All the steps followed in sequence. A coursed random stone wall with end pillar as given in the drawing built.	➢ Plumbing (plumb bob) inside corner. ➢ Bonding pillar and wall ➢ Flush pointing on stone work. ➢ Procedure ➢ Safety precaution

Required tools/equipment: Club hammer, trowel, line and pins, spirit level, plumb bob, mortar board, pan, measuring tape, building square etc
Safety: Use safety boot.

Task Analysis

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Task No. 9**. Identify different brick cuts.**

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Introduce bricks, shape, size and types. 2. Specify the requirements of brick cuts. 3. Practice to make brick cuts of various types needed in the brick building walls. 4. Use gauge box to cut brick in required sizes. 5. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Identify different brick cuts **Standard (How well):** All the steps followed in sequence. Different brick cuts identified.	➢ Needs of brick bats ➢ Types of brick bonds ➢ Rules of Brick bonding in wall and need of brick cuts ➢ Making of gauge box ➢ Use of gauge box

Required tools/equipment: Brick hammer, Brick bolster, tape

Safety: Use safety boots and helmet.

Task Analysis

Task No. 10 **Develop the concepts of Brick bonding in wall.**

Time : 2 hrs
Theory: 2 hrs
Practical: hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Explain the bonding concept in brick wall. 2. Specify the brick bond like stretcher, header, English, Flemish bond. 3. State the brick overlap one above other by at least ¼ brick 4. State the function of brick bonding in brick wall. 5. State the bonding on the face, bonding across the thickness and along the length. 6. Display the brick bonding pattern in brick wall. 7. Keep records.	**Condition (Given):** Classroom, books, notes and handouts **Task (What):** Develop the concepts of Brick bonding in wall. **Standard (How well):** Concepts of brick bonding in brick wall developed.	➢ Brick bonding rules Brick bonding requirements

Required tools/equipment: Bricks, brick cuts.

Safety:

Task Analysis

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Task No. 11. Build a return wall ½ brick thick in stretcher bond 1.5x1m long 1m high with a rectangular opening at 60cm high.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study the given drawing of the wall. 2. Select bricks for the given construction. 3. Select the place for building the given wall. 4. Prepare lime mortar 1:6. 5. Prepare a gauging rod. 6. Layout dry brick to the length as given in the drawing. 7. Spread mortar for the end bricks at both ends. 8. Place the brick adjusting better face on the front. 9. Level it for its horizontality placement with spirit level. 10. Ensure the correct position using lines and pins. 11. Stretch line to fill in the middle. 12. Cut a brick in to half. 13. Lay mortar on the end bricks and their adjacent and place cut brick turning the cut toward the next brick to com. 14. Build the wall up to 60 cm high at required position. 15. Build walls on either side of the opening leaving the size of opening. 16. Clean all tools & equipment & put at proper place 17. Clean working place. 18. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Build a return wall ½ brick thick in stretcher bond 1.5x1m long. 1m high with a rectangular opening at 60cm high. **Standard (How well):** All the steps followed in sequence. A return wall ½ brick thick in stretcher bond 1.5x1m long 1m high with a rectangular opening at 60cm high built.	➢ Setting the wall on ground using builder's square ➢ Gauging return wall. ➢ Gauging brick wall for courses. ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod
Safety: Wear safety boots.

Task Analysis

Time : 10 hrs
Theory: 1 hr
Practical: 9 hrs

Task No. 12. Build 1 Brick thick Straight wall in English bond, 1m long and 75cm high with one end attached to a pillar (1.5 x1.5 B) and the other raked back.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set the line of the wall on ground. 2. Prepare mortar. 3. Gauge the length of wall with dry brick and joints. 4. Start laying brick over mortar spread in stretcher position with one cm gap in between the two stretcher bricks at the ends. 5. Plumb front and side at the stopped end and front only in racked backed end. 6. Ensure that the two stretcher bricks and a joint are equal to 1 brick thick. 7. Stretch a line from the top edge of the stretcher brick of the front at the ends and fill in the portion with bricks lying in stretcher. 8. Spread mortar on the stopped end properly and place brick in header position. 9. Level and plumb it and put a queen closer at the side of the header to break the vertical joint. 10. Start laying bricks on the racked back end by only plumb and level the brick in header laid just on the middle of the stretcher brick. 11. Continue building wall in this pattern. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build 1 Brick thick Straight wall in English bond, 1m long and 75cm high with one end stopped and the other raked back. **Standard (How well):** All the steps followed in sequence. 1 brick thick straight wall in English bond to a given dimension built.	➢ Pattern of English bond ➢ Plumbing end corners ➢ Maintaining racking back, its use and purpose ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod
Safety: Wear safety boot.

Task Analysis

Task No. 13. Build 1 brick thick return wall in English bond providing a rebate for a door frame and Brick on Edge (BoE) sill for a window at 90cm high, of 2m x 1.5m long and 2m high.

Time : 10 hrs
Theory: 1 hr
Practical: 9 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain drawing of the wall assigned to build. 2. Set out the wall given in the drawing on the ground. 3. Prepare mortar required for the wall. 4. Collect bricks nearby required for the wall. 5. Worked out the wall for door and window so that the openings do not cause irregularities in bonding by laying dry bricks on the ground. 6. Make a gauging rod to control height of the wall. 7. Build walls on both sides of the door opening up to 90cm high. 8. Leave window opening at 90 cm high at the position as given in the drawing. 9. Lay brick on edge by projecting ¼ brick out of the wall for window sill. 10. Build the remaining height of the wall up to 2m high. 11. Use trestle scaffold to work at high inaccessible level. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build 1 brick thick return wall in English bond providing a rebate for a door frame and Brick on edge (BoE) sill for a window at 90cm high, of 2m x 1.5m long and 2m high. **Standard (How well):** All the steps followed in sequence. A 1-brick thick return wall of given size in the drawing, providing door and window opening and BoE sill for window built.	➢ Gauging wall for maintaining bonding patter ➢ Brick of edge course ➢ Working in door and window openings in wall ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder 'square
Safety: Wear safety boot.

Task Analysis

Task No. 14. Build 1 brick thick 1.5m long straight wall and 1 m high in Flemish bond and point it with a colorful stuff on both front and side faces.

Time : 10 hrs
Theory: 1 hr
Practical: 9 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set out the wall on the ground. 2. Prepare mortar. 3. Spread mortar for laying bricks at corner first. 4. Start laying brick in header brick followed by a queen closer followed by stretcher. 5. Continue building wall followed by header after every stretcher. 6. Plumb and level end bricks. 7. Stretch line from the upper edge of the laid brick and fill in the vacant portion in header after stretcher patter to give Flemish bond. 8. Start second course with stretcher at the start an end then followed by header and stretcher. 9. Provide ¾ brick bat at the end in case the wall does not end with header brick. 10. Prepare the pointing surface by cleaning and taking out the mortar of the joint by 1cm. 11. Prepare pointing stuff in 1:2 with desired pigment. 12. Take the stuff on hawk in one hand and pointing key in the next hand. 13. Start pointing from right to left and vertical joint and then horizontal. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 16. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build 1 brick thick 1.5m long straight wall and 1 m high in Flemish bond and point it with a colorful stuff on both front and side faces. **Standard (How well):** All the steps followed in sequence. 1 brick thick wall in Flemish bond of given size and finish by pointing in color built.	➢ Flemish garden wall bond ➢ Pointing types ➢ Pointing techniques. ➢ Preparing color stuff for pointing purpose ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder 'square, hawk, pointer key.
Safety: Wear safety boot.

Task Analysis

Task No. 15. Build one brick thick return wall of 2x1m long and 1m high in Flemish Bond giving a window opening at 40cm high with BoE sill.

Time : 10 hrs
Theory: 1 hr
Practical: 9 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set out the wall on the ground by marking. 2. Prepare mortar. 3. Start laying bricks with header and then queen closer and then stretcher from one end towards the return. 4. Provide ¾ brick at the corner if it has to adjust for the vertical joint. 5. Keep examining plumbing and leveling of all courses so that it does not become too late for correction. 6. Keep checking the courses from gauging rod from time to time. 7. Leave the opening when it reaches 60 cm height on the limb where window opening has to come. 8. Lay bricks on edge so that it makes 60 cm at the top of the BoE. 9. Project Brick on edge by ¼ of brick from the face. 10. Ensure the shadow on the projection become a straight line like straight edge of brick under stretched line. 11. Build the rest of wall to make as given in the drawing. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build one brick thick return wall of 2x1m long and 1m high in Flemish Bond giving a window opening at 40cm high with BoE sill. **Standard (How well):** All the steps followed in sequence. One brick thick return wall of 2x1m and 1m high with a window opening at 60cm height in Flemish bond built.	➢ Openings in Flemish bond ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder 'square.
Safety: Wear safety boot.

Task Analysis

Time : 10 hrs
Theory: 1 hr
Practical: 9 hrs

Task No. 16. **Build a cross wall in one brick thick in English bond of 1x1m long and 1m height.**

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set out line of the cross wall on ground. 2. Prepare mortar. 3. Gauge the wall length with dry bricks lay allowing cross joints of 1cm. 4. Lay brick in header over mortar spread followed by a queen closer at both ends. 5. Stretch a line from the upper corners of end bricks to give guide for line and level. 6. Fill in the vacant with bricks in proper bond. 7. Spread mortar on other ends of other wall. 8. Lay brick in stretcher position, just opposite of the brick pattern of other cross wall. 9. Build the brick wall up to the given height measuring the courses with gauging rod from time to time. 10. Check the angles for its right angles. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build a cross wall in one brick thick in English bond of 1x1m long and 1m height. **Standard (How well):** All the steps followed in sequence. A cross wall in one brick thick in English bong, 1x1m length and 1m height built.	➢ Crossing walls and their bonding patterns ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder 'square
Safety: Wear safety boot.

Task Analysis

Time : 10 hrs
Theory: 1 hr
Practical: 9 hrs

Task No. 17. **Build a cross wall in one brick thick Flemish bond of 1x1m long and 1m high.**

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set out the position of wall on ground by marking. 2. Prepare required type of mortar. 3. Spread mortar on the marked position at the ends first. 4. Lay bricks starting with header and followed by queen closer and then stretcher. 5. Lay bricks header stretcher header pattern to give Flemish bond. 6. Complete the first course of the first cross wall. 7. Spread mortar for the other cross wall at the ends. 8. Lay bricks so that the junction tallies the joint with the brick of first cross wall. 9. Spread mortar on the junction and place bricks so that the vertical joints break. 10. Provide ¾ bats as stretcher bricks at the end if so occur. 11. Keep courses of both walls leveled using gauging rod. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build a cross wall in one brick thick Flemish bond of 1x1m long and 1m high. **Standard (How well):** All the steps followed in sequence. A cross wall of one brick thick in Flemish bond built as per drawing.	➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder 'square

Safety: Wear safety boot.

Task Analysis

Time : 13 hrs
Theory: 1 hr
Practical: 12 hrs

Task No. 18. **Build 1.5 brick thick wall in English bond of 1.5m long and 1m high covering with brick capping and pointing all faces**.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set out the wall on the ground as per given in the drawing. 2. Prepare mortar and bring at your working place. 3. Spread mortar on the ground to receive the brick of 1½ Brick thick. 4. Place one row of stretcher bricks on the front and header followed by queen closer in the back and then header bricks. 5. Put the opposite in the next course of brick i.e. the rear on the front and the front on the rear. 6. Build the wall in such a way that both the faces- front and back, had bricks laid under the guidance of stretched line from the edges of the corner bricks. 7. Maintain brick face on the all sides of the wall. 8. Finish the wall with brick on edge capping at the top of the wall. 9. Prepare cement sand 1:3 stuff with color pigment to point the faces of the wall. 10. Point the wall faces –front and rear and sides. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build 1.5 brick thick wall in English bond of 1.5m long and 1m high covering with brick capping and pointing all faces. **Standard (How well):** All the steps followed in sequence. One and half brick thick wall in English bond of a given size in drawing built.	➢ Bonding of bricks in 1½ brick thick English bond ➢ Capping of wall ➢ Pointing all faces of a wall ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder 'square, Pointing key, hawk.
Safety: Wear safety boot.

Task Analysis

Time : 16 hrs
Theory: 1 hr
Practical: 15 hrs

Task No. 19. Build an arch of semicircular arch type, radius 60cm over a door opening with brick on header course.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare a wooden arch of 60cm radius from a soft wood. 2. Build a wall with an opening of 1.20 m to fit a door frame to a height of 2.1m and 3m long. 3. Set wooden arch on top of 2.1m props. 4. Align the arch with the brick face. 5. Center the arch with the door opening. 6. Ensure that the wooden arch set at 2.1m high using props is stable and string. 7. Make voussoir of bricks on the flat ground by making trapezoidal shape of each brick to come over arch. 8. Lay the trapezoidal brick in header on top of wooden arch giving equal mortar joints. 9. Build the wall at spandrel portion by cutting bricks to fit the curved external portion of brick arch giving a smooth joint. 10. Point the surface with plain cement sand mortar. 11. Clean the wall by using broom or brushing the surface. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** A drawing of a door opening in a wall with a semicircular arch is given. **Task (What):** Build an arch of semicircular arch type, radius 60cm over a door opening with brick on header course. **Standard (How well):** All the steps followed in sequence. A wall with a semi circular arch over a door opening with the dimensions given in the drawing built.	➢ Making brick voussoir for a particular arch ➢ Building wall in the portion spandrel by cutting bricks to required shape ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder's square, pointing key, hawk. Cross cut saw, crow bar etc.
Safety: Wear safety boot and safety helmet.

Task Analysis

Task No. 20. Make brick lintel for 1.2 m wide window opening in a BoE pattern and build 30cm high wall on it.

Time : 16 hrs
Theory: 1 hr
Practical: 15 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Build a wall of about 3m long to take 1.2m window opening in the middle of the wall at 90cm high in any bond of brick. 2. Build walls either side of the opening up to 1.5m high. 3. Obtain a 1.5m steel lintel / wooden plank of 38mm thick to come over window opening. 4. Keep courses of bricks at equal height after the window opening using water pipe level or spirit level over a straight edge 5. Check the level of the walls at the lintel level of 2.4m high. 6. Place the wooden or steel lintel over the window opening providing bearing of 15cm either side. 7. Lay bricks of best edges of downside in BoE on the wooden/steel lintel on dry bed but with side joints of mortar. 8. Spread mortar over the brick lintel and lay bricks as in normal walls. 9. Support the wooden / steel lintel for the start from below it until the brick work set. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Make brick lintel for 1.2 m wide window opening in a BoE pattern and build 30cm high wall on it. **Standard (How well):** All the steps followed in sequence. A brick lintel over a window opening as per drawing built.	➢ Brick lintel in building. ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, Cross cut saw, crow bar etc.
Safety: Use safety boot and safety helmet.

Task Analysis

Time : 13 hrs
Theory: 1 hr
Practical: 12 hrs

Task No. 21. **Build a gable wall to fit a roof truss 3m span and 90cm rise in English bond.**

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Mark the position of gable walls of span 3m at distance of 3m apart. 2. Make a template or from work to guide gable wall. 3. Fix the template / form work at the side of wall building. 4. Prepare mortar of required materials and ratio. 5. Build brick wall on the 3m span distance for the first course. 6. Rack back the wall for the slope of the gable. 7. Build the gable wall up to required height. 8. Level the slope of the gable with cut bricks and mortar. 9. Transfer the level to another gable wall. 10. Finish the building of other gable wall and check the level of height. 11. Finish the slope of gable to receive Purl in or wall plate for roofing work. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build a gable wall to fit a roof truss 3m span and 90cm rise in English bond. **Standard (How well):** All the steps followed in sequence. Gable walls as given in the drawing built.	➢ Concept of gable wall building ➢ Use of template ➢ Leveling gable to receive wall plate ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, Cross cut saw, crow bar etc
Safety: Wear safety Boot and safety helmet.

Task Analysis

Time : 13 hrs
Theory : 1 hr
Practical: 12 hrs

Task No. 22. **Build block wall with hollow block for 3m long and 2m high and rough caste.**

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare mortar for the block work. 2. Collect blocks for the building of block wall. 3. Mark the position of block work wall. 4. Spread mortar for the corner blocks. 5. Put the corner block in position and adjust it for its horizontal and vertical level. 6. Put line on the upper edge of the corner block and stretch to the other corner block to guide the intermediate blocks. 7. Put mortar in side joints after putting the blocks in their positions later with trowel. 8. Spread mortar over the laid block but it is not necessary to put into the hollow of the blocks. 9. Cut Block into half or quarter as the need be using bolster and hammer. 10. Put the cut block on the corner of the next course breaking vertical joint. 11. Build the block wall same as before in the first course. 12. Use trestle for high level working. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build block wall with hollow block for 3m long and 2m high and rough caste. **Standard (How well):** All the steps followed in sequence. Block wall of given size in the drawing and instruction built.	➢ Introduction to block, types and use ➢ Handling technique in building block wall ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level.
Safety: Wear safety boot and safety helmet.

Task Analysis

Task No. 23. Perform cement sand plastering work on floor/wall/ceiling.

Time : 19 hrs
Theory: 1 hr
Practical: 18 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare plastering stuff of cement sand as in required ratios. 2. Prepare plastering background to ensure well keying by removing loose and foreign materials from the surfaces. 3. Transfer levels from a given datum for the finished level of the plaster surface on to dots. 4. Make dots at convenient distances on plastering surface to guide plaster finish levels. 5. Apply plastering stuff from one corner with the help of hawk and floater. 6. Finish the surface by rubbing the surface with sponge or steel floater to bring smooth surface. 7. Apply straight edge for making sharp edges. 8. Remove any tendrils from the finished surface if any and finish it again while it is still green. 9. Cure the surface from the next day by sprinkling water thrice a day on the surface for a week. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and specification **Task (What):** Perform cement sand plastering work on floor/wall/ceiling. **Standard (How well):** All the steps followed in sequence. Plaster on floor, wall or ceiling performed as per specification.	➢ Purpose of plastering ➢ Method of plastering ➢ Ratios of cement sand for plastering ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortarboard, water level, spirit level, hawk, trestle, floater, straight edge, Brushes etc
Safety: Wear safety boot and safety helmet

Task Analysis

Task No. 24. Perform pointing with color cement sand stuff on masonry wall.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect the tools required for the pointing work. 2. Determine types of pointing to be carried out. 3. Prepare background on masonry wall for pointing. 4. Prepare pointing stuff with cement sand 1:3 with instructed color pigment. 5. Apply the prepared stuff with pointing key from suitable corner. 6. Work until the given area is completely pointed with the type and pattern of pointing. 7. Cure the surface from the next day by sprinkling water thrice a day on the surface for a week. 8. Clean all tools & equipment & put at proper place 9. Clean working place. 10. Keep records.	**Condition (Given):** Masonry wall area, necessary tools, equipment, materials and specification **Task (What):** Perform pointing with color cement sand stuff on masonry wall. **Standard (How well):** All the steps followed in sequence. Commonly used pointing work on masonry wall performed.	➢ Characteristics of pointing. ➢ Functions of pointing on masonry wall ➢ Types of pointing. ➢ Ratios of cement sand for pointing. ➢ Pigments used for color pointing. ➢ Procedure ➢ Safety precaution

Required tools/equipment: Pointing key, pointing trowel, hawk, brush, water can, wire brush, nails, plastic sheet etc
Safety: Wear safety boot and safety helmet

Task No. 25. Prepare/laying/compacting/curing concrete 1:2:4 in a given place.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect the tools required for the pointing work. 2. Batch the ingredients in a given ratio. 3. Mix the batched ingredients in dry state thoroughly. 4. Heap the dry mix and add water making thorough wet mix giving a uniform color. 5. Check the paste (green concrete) if it has been ready for use. 6. Prepare the place of concreting. 7. Place the green concrete properly in its place. 8. Spread the concrete uniformly. 9. Compact the spread concrete. 10. Level the compacted concrete. 11. Leave the compacted concrete for 24 hour as it is and arrange water pool or wet coverage for curing for about a week. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Site/workshop necessary tools, equipment, materials and specification **Task (What):** Prepare/laying/compacting/curing concrete 1:2:4 in a given place. **Standard (How well):** Green concrete prepared from given concrete ingredients laid, compacted and made ready for curing.	• Introduction to concrete, • Ingredients of concrete and its ratios. • Procedure of preparing green concrete • Techniques of placing, spreading and compacting concrete • Curing and its methods

Required tools/equipment: Batching box, mixing platform, shovel, line and level, wooden stroke, straight edge, tape, trowel, template etc.
Safety: Wear safety boot and safety helmet

Additional Competencies

In

Masonry

Rat Trap Bond Technology

Description
This course is designed to equip trainees with the knowledge and skills on rat trap bond masonry technique to be applied in building construction works. This sub module deals with the Principle of rat trap bond, Tools handling technique, Wall designing and laying out pattern and various shapes of wall construction.

Duration: 30 hours

Competencies in Rat Trap Bond Masonry

1. Explain the principle of rat trap bond
2. Identify/handle tools/materials required in rat trap bond masonry work
3. Layout/design rat trap bond masonry wall
4. Interpret rat trap bond walling/construction details
5. Build 1 Brick thick rat trap bond straight wall of size 1.5m long and 75cm high
6. Build 1 brick thick rat trap bond return wall of size 2m x 1.5m long and 2m high.
7. Build 1 brick thick rat trap bond T wall of size 1m x1m long and 70cm high
8. Build 1 brick thick rat trap bond reinforced cross junction wall of size 1m x1m long and 70cm high
9. Build 1 ½ brick thick reinforced concrete Quetta bond straight wall of size wall 1m long and 70cm high

Task Analysis

Task No. 1. Explain the principle of rat trap bond.

Time : 2 hrs
Theory: 2 hrs
Practical:

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Introduce rat trap bond 2. Explain rat trap bond technique. 3. State uses of rat trap bond. 4. Know the application / suitability of rat trap bond masonry wall. 5. List the purpose of rat trap bond masonry wall. 6. State the procedure to be employed in building rat trap bond wall. 7. List advantage/disadvantage of rat trap bond technology. 8. List the specific rat trap bond masonry rules. 9. Keep records.	**Condition (Given):** Classroom, textbook and manual, dry bricks and platform. **Task (What):** Explain the principle of rat trap bond. **Standard (How well):** The principle of rat trap bond well explained and shown in dry state and the rules of specific rat trap bond masonry listed.	**Rap Trap Bonds** ➢ Introduction ➢ History ➢ Where to use ➢ Purpose ➢ Method ➢ Advantages ➢ Disadvantages ➢ Specific rat trap bond masonry rules

Required tools/equipment:
Safety:

Task Analysis

Time : 2 hrs
Theory : 1 hr
Practical: 1 hr

Task No. 2. Identify/handle tools/materials required in rat trap bond masonry work.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. List of tools required for rat trap bond masonry works **(*same as the tools mentioned in masonry sub module)*** 2. List the function of each tool. 3. Handle the tools 4. Take care and maintenance of the tools. 5. Identify materials 6. List the quality of materials 7. Keep records.	**Condition (Given):** Workshop and tools **Task (What):** Identify/handle tools/materials required in rat trap bond masonry work. **Standard (How well):** Tools required for rat trap bond masonry works well identified and handled. Specification of tools and materials well stated.	➢ Required tools ➢ Identification, specification and function of the tools ➢ Brick and its quality ➢ Tools handling technique ➢ Safety precautions

Required tools/equipment: All tools and materials used in masonry works displaying on table
Safety:

Task Analysis

Task No. 3. Layout/design rat trap bond masonry wall

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Clean the surface on which a pattern of rat trap bond brick wall is to be laid. 2. Lay three bricks in stretcher in brick of edge position at one end of the wall. 3. Put a brick next to stretcher in header in brick of edge position. 4. Lay brick on edge in stretcher wise and header and so one alternatively. 5. Lay two bricks header wise at the other end or as demanded by the wall length or over the first course on the same end of the wall. 6. Make sure that next to headers at the end is laid stretcher brick – one at the face and the other rear of it making cavity. 7. Lay bricks in brick on edge header and then stretcher wise alternatively. 8. Reverse the pattern of the brick bonds laid at the ends for the second course. 9. Build the wall in rat trap bond in the similar pattern with alternative courses as done in odd and even courses up to the required height.	**<u>Condition (Given)</u>:** Workshop, necessary tools, equipment, drawing and bricks. **<u>Task (What)</u>:** Layout/design rat trap bond masonry wall. **<u>Standard (How well)</u>:** All the steps followed in sequence. A wall in rat trap bond designed and laid on a platform.	➢ Design concept and Brick on Edge concept. ➢ Rat trap bond. ➢ Good quality of rat trap bond ***(Full header and full stretcher brick)*** ➢ Standard brick size ➢ Calculation of bricks for a wall length in rat trap bond

Required tools/equipment: Brick hammer, Chisel
Safety: Put on safety boots

Task Analysis

Task No. 4. Interpret rat trap bond walling/construction details

Time : 3 hrs
Theory : 2 hrs
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Explain the pattern shown on the elevation of a wall built in rat trap bond. 2. Explain the use of brick in brick on edge laying. 3. Identify header and stretcher positions of brick on edge laying. 4. Explain the causes of starting a wall with two headers followed by a stretcher. 5. Explain the start of a wall with ¾ stretcher followed by header and stretcher. 6. Explain the advantages of rat trap bond over other types of bonds. 7. List out the disadvantages of rat trap bond. 8. Explain the specific rat trap bond rules.	**Condition (Given):** Drawings and details of Rat trap bond walling available. **Task (What):** Interpret rat trap bond details. **Standard (How well):** All the steps followed in sequence. Details of rat trap bond walling and construction details interpreted.	➢ Patterns seen on elevation of rat trap bonding wall. ➢ Revision of types of bond ***(As mentioned in masonry sub module)*** ➢ Good quality of rat trap bond ***(Full header and full stretcher brick)*** ➢ Standard brick size ➢ Advantages and disadvantages of rat trap bonding walls. ➢ Calculation of bricks for a wall built in rat trap bond.

Required tools/equipment:
Safety:

Task Analysis

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Task No. 5 Build 1 Brick thick rat trap bond straight wall of size 1.5m long and 75cm high.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set the line of the wall on ground. 2. Prepare mortar. 3. Gauge the length of wall with dry brick and provision for joints. 4. Lay bricks over spread mortar in stretcher/header position with a joint gap in between the bricks at the ends. 5. Plumb front and side of the quoin brick and the face only of the racked back bricks. 6. Level for horizontality and gauge layers at both ends. 7. Stretch a line from the top edge of the plumbed, leveled bricks through the fronts at the ends and lay bricks with mortar in between. 8. Lay quoin bricks in header/ stretcher at the stopped end properly as required for the second course. 9. Ensure that the ends are solid wall equal to one brick length by providing a cut brick in the cavity made by stretcher bricks. 10. Plumb and level it. 11. Lay bricks in the racked back portions under the guidance of a stretched line. 12. Build the wall up to the given height or courses. 13. Clean all tools & equipment & put at their proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing. **Task (What):** Build 1 Brick thick rat trap bond straight wall of size 1.5m long and 75cm high. **Standard (How well):** All the steps followed in sequence. One brick thick straight wall in rat trap bond to a given dimension built.	➢ Quality of brick ➢ Pattern of rap trap bond ➢ Rules for joint (horizontal & vertical joints) ➢ Specific rap trap bond masonry rules ➢ Brick (Odd & even) courses ➢ Plumbing end corners ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod

Safety: Wear safety boot.

Task Analysis

Task No. 6 Build 1 brick thick rap trap bond return wall of size 2m x 1.5m long and 2m high.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set out the return wall on the ground by marking. 2. Prepare mortar. 3. Start laying bricks from the return. 4. Lay two headers and then stretcher and header alternatively in one limb of the return wall. 5. Continue laying bricks in rat trap bond up to the end of the wall length. 6. Close the end either with three stretchers of a header at the end of the wall. 7. Ensure that the return is at the right angle or as correct as examined by the builder's square. 8. Ensure that the height is attained only 7 to 8 curses in a day. 9. Keep examining plumbs and levels of all courses. 10. Keep checking the courses from gauging rod and the limbs with builder's square for its return. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing. **Task (What):** Build 1 brick thick rat trap bond return wall of size 2m x 1.5m long and 2m high. **Standard (How well):** All the steps followed in sequence. One brick thick return wall of 2x1.5 m and 2m high with a window opening at 60cm height in Flemish bond built as per drawing.	➢ Knowledge of Rat trap bond pattern for a return wall. ➢ Knowledge of gauge rod making, ➢ Knowledge of ends closing, ➢ Knowledge of tools and equipment required for building a return wall in rat trap bond. ➢ All necessary Safety precautions

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder 'square
Safety: Wear safety boot.

Task Analysis

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Task No. 7 Build 1 brick thick rap trap bond T wall of size 1m x1m long and 70cm high.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set out line of the cross wall on ground by chalking. 2. Prepare mortar. 3. Gauge the wall length with dry bricks lay allowing cross joints of 1cm. 4. Lay a straight brick wall in rat trap bond for the first course. 5. Build T-joining wall starting either from the stretcher or header at the middle of the joining wall. 6. Check plumb at corners and ends and the returns of the joining wall. 7. Lay second course of brick in rat trap bond giving every header coming at the center of each stretcher brick position. 8. Build the wall up to the height with courses gauged. 9. Ensure that the corners and ends of the T-wall are plumbed, gauged and checked right angle returns. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**<u>Condition (Given)</u>:** Workshop, necessary tools, equipment, materials and drawing **<u>Task (What)</u>:** Build 1 brick thick T-wall of size 1mx1mx70cm in rat trap bond. **<u>Standard (How well)</u>:** All the steps followed in sequence. A T-wall of 1mx1mx70cm high in rat trap bond built as per drawing.	➢ T-walls and their bonding patterns ➢ Procedure ➢ Gauging, checking returns and plumbing points and leveling points for T-wall. ➢ Safety precautions.

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder 'square
Safety: Wear safety boot.

Task Analysis

Time : 4 hrs

Task No. 8 Build 1 brick thick rat trap bond reinforced cross junction wall of size 1m x1m long and 70cm high.

Theory: 1 hr

Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set out the position of wall on ground by marking. 2. Prepare required type of mortar. 3. Prepare reinforcement steel rods of required numbers and lengths. 4. Spread mortar on the marked position at the ends first. 5. Lay first course of t-junction wall first. 6. Erect steel reinforcing rod by supporting to stand in its position by shoring. 7. Lay second and third courses quickly so that the steel rods stand in their positions. 8. Provide horizontal steel bars / distribution bars in stated courses, usually 6 courses, by binding with vertical bars. 9. Put concrete or mortar as per instruction in the trap hole to hold the rod straight and stand. 10. Ensure that the plumb, level or gauge and the return angles are truly maintained. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build 1 brick thick rat trap bond reinforced cross junction wall of size 1m x1m long and 70cm high **Standard (How well):** All the steps followed in sequence. A reinforced cross junction wall of one brick thick rat trap bond built as per drawing.	➢ Concreting knowledge. ➢ Reinforcement bars - main bars and distribution bars. ➢ Bar sizes in use ➢ Bar binding techniques. ➢ Brick reinforcing wall. ➢ Shoring steel rod. ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder 'square

Safety: Wear safety boot.

Task Analysis

Task No. 9 Build 1 ½ brick thick reinforced concrete Quetta bond straight wall of size 1m long and 70cm high.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Set out the wall on the ground as per given in the drawing. 2. Prepare mortar and concrete in the ratio as given. 3. Spread mortar on the ground to receive the brick of 1½ Brick thick-may it be straight or return wall as per drawing. 4. Place a brick in stretcher position followed by a header and stretcher alternatively for the front face. 5. Follow the header part with a queen closer and then stretcher, giving ¼ brick bat cavity. 6. Ensure that header position of brick comes over or under the middle of stretcher brick. 7. Build the wall accordingly to give regular pattern- headers above or under stretcher in the middle. 8. Insert reinforcing steel rods – two or more tied with a stirrup a near bottom and then @ spacing provided in the drawing. 9. Fill in the cavity holding steel bars with concrete 10. Provide horizontal bar if necessary at every 6 course 11. Build the wall up to the height and also put concrete in the hole and compact. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Build 1½ brick thick reinforced Quetta bond straight wall of size 1m long and 70cm high. **Standard (How well):** All the steps followed in sequence. One and half brick thick reinforced Quetta bond wall built as per drawing.	➢ Bonding of Quetta bond in 1½ brick thick. ➢ Selection, cutting and binding of reinforcement steel ➢ Concreting and compacting techniques ➢ Placement of reinforcements and binding. ➢ Procedure ➢ Safety precaution

Required tools/equipment: Brick hammer, trowel, Mortar board, line and pins, spirit level. Gauging rod, builder'square.
Safety: Wear safety boot.

Module Code: M 1
Sub module Code: SM 1.1

Sub module Title: Tile Fitting

Description

This sub module is designed to equip trainees with the knowledge and skills on tile fitting works on the wall and floor of various parts of building. The course deals with bathroom tiling, kitchen tiling, passage and stair tiling both with glazing and non glazing tiling which have been laid in Nepal as well as abroad.

Duration: 80 hours

Competencies in Tiling

1. Develop the concept of tiling.
2. Identify commonly available tiles.
3. Identify design/pattern of tiling.
4. Identify tools and equipment for tiling.
5. Calculate no of tiles required for a given area.
6. Prepare 1:4 cement sand mortar.
7. Prepare background surface for tiling.
8. Prepare cement sand slurry 1:1.
9. Lay glazed common tile on wall in 1:1 c/s slurry (bathroom/kitchen/plinth height/skirting).
10. Lay decorative tile (contrast) on wall in 1:1 c/s slurry (bathroom/kitchen/plinth height/skirting).
11. Lay border tiles on wall in 1:1 c/s slurry.
12. Lay non-slippery tile on floor (bathroom, tread, and sill).
13. Lay non-slippery tiles on kitchen/living room floor.
14. Lay PVC tile on floor using adhesive material (glue).
15. Lay marble in staircase.
16. Perform terrazzo-flooring work with various sizes of marbles chips.

Task Analysis

Time : 2 hr
Theory: 2 hr
Practical: hrs

Task No: 1. Develop the concept of tiling.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Introduce tile. 2. Explain the purposes of tiling. 3. Explain the manufacturing process of tiling. 4. Explain different types of tiles available in the market. 5. Keep records.	**Condition (Given):** Classroom, textbook and manual **Task (What):** Develop the concept of tiling. **Standard (How well):** Concept of tiling developed.	➢ Introduction ➢ Types of tile ➢ Purposes of tiling ➢ Commonly available tile ➢ Manufacturing of tile

Required tools/equipment:
Safety:

Task Analysis

Task No: 2. Identify commonly available tiles.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Introduce ceramic tiles 2. Introduce slates (flagstones) 3. Introduce mosaic tiles 4. Introduce marble tiles 5. Introduce glazed tiles 6. Introduce PVC tiles 7. Keep records.	**Condition (Given):** Workshop, notes and samples of different tiles **Task (What):** Identify commonly available tiles. **Standard (How well):** All the steps followed in sequence. Commonly available tiles identified.	➢ Various uses of tiles, slates, marbles, mosaic, glazed tiles and PVC tiles

Required tools/equipment: Tiles.

Safety:

Task Analysis

Time : 3 hrs
Theory: 1hr
Practical: 2 hrs

Task No: **3**. **Identify design / pattern of tiling.**

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Identify tiling design. a) Vertical and horizontal jointing b) Vertical joint alternatives c) Horizontal joint alternatives d) Herring pattern 2. Designs of tiling in colorful patterns. 3. Designs of tiling with shades. 4. Keep records.	**Condition (Given):** Tiling designs are shown on paper, on site and on actual places. (site visit) **Task (What):** Identify design / patterns of tiling. **Standard (How well):** All the steps followed in sequence. Designs and patterns of tiling identified.	➢ Design with tiling ➢ Design with colorful tiles ➢ Design with brightness of tiles ➢ Various patterns available

Required tools/equipment:

Safety: Safety boots while visiting site.

Task Analysis

Task No: 4. Identify tools and equipment for tiling.

Time : 2 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Identify tools: • Trowel • Line and pins • Square • Pipe level/ spirit level • Keeps • Hawk 2. Equipment: • tile cutter • scissor (clipper) • grinder / polisher • jute / sheep hairs • clothes for polishing 3. Keep records.	**Condition (Given):** Tools and equipment used in tiling are displayed. **Task (What):** Identify tools and equipment for tiling. **Standard (How well):** All the steps followed in sequence. Tools / equipment used in tiling identified.	➢ Identification of tools ➢ Function of tools

Required tools/equipment: Tools and equipment used in tiling
Safety: Safety gloves, safety goggles, precautions in using tools and equipment are necessary.

Task Analysis

Task No: 5. Calculate numbers of tiles required for a given area.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Find the size of a tile. 2. Measure the given areas. 3. Divide the measured areas by the size of the tile. 4. Find the no. of tiles thus obtained. 5. Find the size of other tiles (smaller or larger than the first given tile). 6. Calculate the later given tile numbers. 7. Repeat practices for various tile sizes. 8. Repeat practices for various awkward areas available in bathroom, kitchen, etc. 9. Keep records.	**Condition (Given):** Classroom, calculator, sizes of tiles and areas for tiling **Task (What):** Calculate the number of tiles of different sizes for different areas. **Standard (How well):** All the steps followed in sequence. Number of tiles of different sizes calculated for different areas.	➢ Unit of measurements ➢ Tile-sizes ➢ Unitary method for calculating number of tiles ➢ Adjustment for areas smaller than tile size

Required tools/equipment: Pens, pencils, exercise books, calculator.

Safety:

Task Analysis

Time : 4 hrs
Theory: 2 hrs
Practical: 2 hrs

Task No: 6. Prepare 1:4 cement sand mortar.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Identify a standard measuring for batching by volume. 2. Inspect sand for its fine grading. 3. Prepare a platform for mixing the stuff. 4. Inspect the quality of water that should be clean and clear. 5. Use identified standard measuring box, measure sand flush to the box and place on the prepared platform (mixing board). 6. Measure cement and place on top of a sand heap. 7. Mix dries at least 3 times until to lose homogenous in mix color. 8. Add water little by little and mix by overturning the stuff 3 times so that it looks uniform in color and homogenous. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Prepare 1:4 cement sand mortar. **Standard (How well):** All the steps followed in sequence. Cement sand 1:4 mortar prepared.	➢ Nature of good sand ➢ Grading system ➢ Nature / characteristics of good cement ➢ Measuring by volume ➢ Checking of the stuff for its workability Bulking of sand ➢ Procedure ➢ Safety precaution

Required tools/equipment: Shovel, trowel, water bucket measuring box, mixing board / platform, gloves

Safety: cement mix mortar should not be used by direct touching bare hand or foot. It will affect the skin, thus use gloves.

Task Analysis

Task No: 7. Prepare back ground surface for tiling.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Remove loose lumps of mortar, grass or hair tendrils, brick bats if any form the surface. 2. Make scratches on smooth glossy surface to develop mechanical keeping of the surface. 3. Make plain surface by putting mortar in heavy undulation. 4. Make plain surface by cutting undulation by rise of mortar, bricks or plaster. 5. Wire brush the surface how to remove loose particles from the surface. 6. Wet the surface so that the mortar placed on it to stick tiles does not loose its water, making a weak bonding to wall and tile. 7. Clean all tools & equipment & put at proper place 8. Clean working place. 9. Keep records.	**Condition (Given):** Vertical and horizontal surface areas, necessary tools, equipment and materials **Task (What):** Prepare back ground surface for tiling. **Standard (How well):** All the steps followed in sequence. Background surface for tiling prepared.	➢ Evenness of the surface ➢ Leveling depressed surface and ➢ Mechanical keying on smooth surface. ➢ Reasons for making evenness of the background surface for tiling ➢ Procedure ➢ Safety precaution

Required tools/equipment: Wire brush, chisel, hammer, broom, mortar (1:2) with cement sand, trowel.
Safety: Use gloves and safety goggles.

Task Analysis

Task No: 8. Prepare cement sand slurry 1:1.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Screen sand to obtain fine sand of required quantity. 2. Use a measuring box to measure sand and cement. 3. Use a mixing box board which does not absorb water. 4. Measure screened sand with a measuring box and place on mixing box. 5. Measure the cement as given ration to sand and place on top of sand in the mixing board. 6. Dry mix it using trowel, incase it is small in quantity and shovel when it is large by overturning at least three times until to give homogenous color and mix. 7. Add water slowly and keep overturning the mix until it becomes slurry. 8. Clean all tools & equipment & put at proper place 9. Clean working place. 10. Keep records.	**Condition (Given):** Workshop/site, necessary tools, equipment and materials **Task (What):** Prepare cement sand slurry in 1:1 parts. **Standard (How well):** All the steps followed in sequence. Cement sand slurry (1:1) prepared.	➢ Batching of cement and sand ➢ Dry Mixing and wet mixing ➢ Slurry and its function. ➢ Procedure ➢ Safety precaution

Required tools/equipment: Measuring box, trowel, shovel, mixing board.
Safety: Be careful to protect eyes while batching cement as it is fine and dusty.

Task Analysis

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Task No: 9. Lay glazed common tiles on walls in 1:1 cement sand slurry (Bathroom/kitchen/plinth height/skirting).

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare background for tiling by leveling the surface, keying on plaster. 2. Prepare 1:1 cement sand slurry. 3. Wash / soak glazed common tiles. 4. Calculate the number of tiles required for the given surface. 5. Lay required piece of tile at the beginning or at the end on the space that cannot take a full tile. 6. Lift a tile and put the slurry on its back and place on position where it is intended to lay. 7. Make two corners tiles as profile to guide line and pins to control the intermediate tiles. 8. Maintain the level of tiles by using measuring spacer. 9. Leave the joints not more than 2mm wide. 10. Fill the joints with white cement stuff. (It applies to plinth height and skirting.) 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Workshop/site, necessary tools, equipment and materials. **Task (What):** Lay glazed common tiles on walls in1:1 cement sand slurry (bathroom / kitchen / plinth height / skirting). **Standard (How well):** All the steps followed in sequence. Glazed common tiles laid in bathroom, kitchen floor; plinth and skirting in 1:1 cement sand slurry.	➢ Gauzing methods for areas ➢ Fixing profile/ Dots ➢ Use of line and pins ➢ Preparation of tiles ➢ Procedure ➢ Safety precaution

Required tools/equipment: Line and pins, measuring tapes, gauze block, trowel, pointing trowel.
Safety: Use hand gloves and safety boots.

Task Analysis

Task No: 10. Lay decorative tiles on wall in 1:1 cement sand Slurry.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare background surface for tiling in walls or on floors. 2. Select decorative tiles as per house corner's choice. 3. Suggest the owner the best attractive tiles and it patterns in Bath/kitchen or in other places. 4. Prepare background by plastering surfaces, 5. Prepare slurry of cement sand 1:1. 6. Gauze the area floor and walls with the tiles and design the pattern. 7. Transfer level from entrance or any other point for the finish level of the floor 8. Fix finish level (Dots) of the tiling at various points of the areas. 9. Start from either sides – left / right but lay the gauzed cut piece tile at one end and in the next course at other end. 10. Lay tiles to give the most attractive impression. 11. Clean the tiled surfaces with soft moist piece of clothes. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop/site, necessary tools, equipment and materials **Task (What):** Lay decorative tiles on walls in 1:1 cement sand slurry. **Standard (How well):** All the steps followed in sequence. Decorative tiles on walls in bathroom and kitchen lay.	➢ Color types ➢ Color combinations requirement in bathroom and kitchen ➢ Patterns /designs ➢ Procedure ➢ Safety precaution

Required tools/equipment: Tile cutter, tape, builder's square, spirit level, straight edge, trowel, hawk, mixing board, etc.
Safety: Use hand gloves and safety boots.

Task Analysis

Task No. 11. **Lay boarder tiles on wall in 1:1 cement sand slurry**.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Mark the boarder on which tiling has to be done. 2. Inspect boarder tiles available for the work. 3. Gauge the area for providing boarder tiles. 4. Determine the finish level of tiling surface and the boarder tiles. 5. Make dots to transfer finish level of the tiling surface. 6. Gauge the boarder length with the boarder tiles. 7. Lay boarder tiles starting from one corner. 8. Finish the laying of boarder tiles to the whole length required. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop/site, necessary tools, equipment and materials **Task (What):** Lay boarder tiles on wall surfaces. **Standard (How well):** All the steps followed in sequence. Boarder tiles lay on various shapes of areas.	➢ Calculation of boarder of various geometric shapes ➢ Shaping techniques of the boarder tiles ➢ Procedure ➢ Safety precaution

Required tools/equipment: Tile cutter, tape, builder's square, spirit level, straight edge, trowel, hawk, mixing board, etc
Safety: Use hand gloves and safety boots.

Task Analysis

Task No. 12. Lay non-slippery tile on floor/ bathroom /tread / sill.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare background surface maintaining a slope of at least 1:200 slope towards outlets. 2. Prepare 1:1 cement slurry. 3. Prepare 1:2 cement sand mortar. 4. gauge the area with the available size of tile to be used. 5. Fix the highest point on the floor from which downward slope begins. 6. Soak the tiles to be laid now. 7. Lay guiding tiles for finish level at corners or any where suitable. 8. Stretch lines from the guiding tile top edge to give guidance for finish level and line of lying. 9. Lay cut piece of tile that was worked out while gauging the area with at the start at one course and at the end on the other course. 10. Lay tiles using slurry on its back and cement sand mortar 1:2 as its base in place of background. 11. Wipe the surface with a clean wet cloth removing any slurry patch. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Bathroom floor, treads in stair, and sill at window, necessary tools, equipment and materials **Task (What):** Lay non-slippery tile on floor / bathroom / tread /sill. **Standard (How well):** All the steps followed in sequence. Non-slippery tiles lay on floor of bathroom, treads in stair and sill in widows.	➢ Introduction to non-slippery tiles, its purposes, and uses ➢ Procedure ➢ Safety precaution

Required tools/equipment: Tile cutter, tape, builder's square, spirit level, straight edge, trowel, hawk, mixing board, etc
Safety: Use hand gloves and safety boots

Task Analysis

Task No. 13. **Lay non-slippery tiles on kitchen / living room floor.**

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare background in kitchen / living room floor with cement sand mortar and leave it scratched. 2. Fix finish level of the tiling by transferring finish level from a reference point. 3. Make guiding points (Dots) of the finished level, at various points. 4. Gauge the floor with available tiles to work out for any cut piece. 5. Lay cut piece at the beginning in one course and at the end on the other course if any. 6. Lay corner tiles giving finish level. 7. Use corner tiles as profile to stretch a line to give line and level of finish for intermediate tiles. 8. Check the finish tile with the dots provided in various points from time to time. 9. Clean the finish tiling with a wet cloth within a hand stretch from time to time. 10. Lay tiles backward to come at the exit. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 11. Keep records.	**Condition (Given):** Kitchen and living room floor for tiling, necessary tools, equipment and materials **Task (What):** Lay non-slippery tiles on kitchen / living room floor. **Standard (How well):** All the steps followed in sequence. Non-slippery tiles laid in kitchen and living room floor.	➢ Transfer of level ➢ Working out nos. of tile for the floor ➢ Repair unsettled tile ➢ Curing and grinding of tiling work ➢ Procedure ➢ Safety precaution

Required tools/equipment: Tile cutter, tape, builder's square, spirit level, straight edge, trowel, hawk, mixing board, etc
Safety: Use hand gloves and safety boots.

Task Analysis

Task No. 14. **Lay PVC tiles on floor using adhesive materials.**

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare background by making completely dirt and dustless either using brooms or blower. 2. Inspect PVC tiles for its regular size and finish. 3. Gauge the room floor with the size of the PVC tile available. 4. Inspect the adhesive recommended by the manufacturer of PVC tiles. 5. Use a wide brush to apply adhesive. 6. Apply adhesive on the dustless and dirt less floor from a back corner so that the exit is easy. 7. Lay the PVC tile on the floor on which adhesive has been applied and press to throw out entrapped air. 8. Clean all tools & equipment & put at proper place 9. Clean working place. 10. Keep records.	**Condition (Given):** A floor with concrete finish and leveled, necessary tools, equipment and materials **Task (What):** Lay PVC tiles on floor using adhesive materials. **Standard (How well):** All the steps followed in sequence. PVC tiles lay on a floor.	➢ Introduction to PVC tiles, its function, and uses ➢ Procedure ➢ Safety precaution

Required tools/equipment: wide Brush, air blower, broom, pressing roller.
Safety: Do not leave any air, dirt or dust below the PVC tile.

Task Analysis

Task No. 15. Lay marble in staircase.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare stairs by cleaning, wetting, and leveling the stairs. 2. Prepare cement sand mortar in 1:3. 3. Cut marbles slab to the size of width of stair and going in required numbers. (Going = tread + nosing + marble thickness and mortar bedding) 4. Cut the marble slab equal to rise, which is total rise minus twice the thickness of marble slab in the required number. 5. Start laying marble cut slab from the bottom tread of the stair. 6. Lay rise marble slab on top of the tread slab flush to immediate top tread. 7. Lay mortar on the second tread and place cut marble slab for tread. 8. Continue for all the treads and risers laying in the similar way. 9. Lay marble slab for landing as laid tread slab. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Stair, necessary tools, equipment and materials **Task (What):** Lay marble in staircase. **Standard (How well):** All the steps followed in sequence. Marble slabs on stair laid.	➢ Rise and tread calculation ➢ Nosing ➢ Embedment of marble slabs ➢ Procedure ➢ Safety precaution

Required tools/equipment: Marble cutter, trowel, measuring tape, chisel, mallet,
Safety: Protect marble slab lying for 2/3 days to cure.

Task Analysis

Task No: 16. **Perform terrazzo-flooring work with various sizes of marbles chips.**

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare background by removing loose and lumps particles from the concrete bed surface. 2. Divide the surface into panel not exceeding 2 Sq. m using minimum 25mm wide and 1.5mm thick strip of glass, aluminum, copper or timber for 40mm thick terrazzo flooring. 3. Wet the surfaces and smear neat cement to receive 34mm thick cement conc. (1:2:4) as under layer. 4. Lay cement concrete (1:2:4) in each alternative panel and compact to required thickness and roughen the surface slightly. 5. Prepare a paste of marble chips and white cement in 3:1 marble. 6. Fix floor finish level by making dots at various points. 7. Lay the paste of marble and white cement over the under layer concrete surface after it is hardened sufficiently. 8. Add more chips if necessary on the surface and compact them. Add Crazy chips if wanted so. 9. Level the surface using floaters and trowel. 10. Leave the surface to dry for about 18 hours and then start curing for 2 to 4 days. 11. Grind the surfaces with 60 grit carborundum stone first and then wash. 12. Use 120 and 180 to 320 to 400 grit carborundum stone to finish the surface. 13. Wash the surface with dilute oxalic acid solution, polish by floor polishing machine fitted with felt or Hessian till it shines. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 16. Keep records.	**Condition (Given):** Floor, necessary tools, equipment, materials, specification for a terrazzo flooring finish **Task (What):** Perform terrazzo flooring with various sizes of marble chips. **Standard (How well):** All the steps followed in sequence. Terrazzo floor finish performed.	➢ Floor finish types ➢ Granolithic, terrazzo and mosaic ➢ Grinding methods ➢ Procedure ➢ Safety precaution

Required tools/equipment: shovel, trowel, floater, brush, roller, straight edge, spirit level, water level pipe etc.

Safety: Wear safety boots.

Module Code: M 2

Module Title: Shuttering Carpentry, Scaffolding and Bar Bending

Description

This module is designed to equip trainees with the knowledge and skills on shuttering carpentry, scaffolding and bar bending works which come on building and other civil structures. On shuttering, it deals with foundation and super structure components shuttering arrangement. Dependent and independent bamboo and wood arrangement as well as tubular type scaffolding are dealt under scaffolding. Similarly, bar bending, bar binding and placing are dealt under bar bending.

Aim

This module aims to equip trainees with knowledge and skills based on the job required to be performed by a Shuttering Carpenter, a Scaffolder and a Bar Bender in Nepal and abroad.

Objectives

After completion of this module the trainees will be able to:

1. Perform frameworks erection for foundation and super structure components.
2. Erect dependent and independent bamboo and wood arrangement scaffoldings and tubular type scaffolding.
3. Perform bar bending, binding and bar placing works.

Prerequisite: Basic general module completed.

Duration: 370 hours (210 hours in house training and 160 hours OJT)

Module Structure (M 2)

S.N.	Code	Sub-modules	Nature	Total hours	Full marks
1	SM 2.1	Shuttering Carpentry	T+P	70	200
2	SM 2.2	Scaffolding	T+P	70	
3	SM 2.3	Bar Bending	T+P	70	
4		On the Job Training (1 month)	P	160	100
			Total	**370**	**300**

Module Code: M 2
Sub module Code: SM 2.1

Sub module Title: Shuttering Carpentry

Description

This sub module is designed to equip trainees with the knowledge and skills on shuttering carpentry related to temporary construction. The course focuses foundation and super structure components shuttering arrangement of wood as well as metal for the casting of Reinforcement Cement Concrete beams slabs and columns.

Duration: 70 hours

Competencies in Shuttering Carpentry

1. Develop concept of shuttering.
2. Interpret working drawing.
3. Identify tools and equipment used for shuttering.
4. Identify elements of shuttering (props, bottom, side, bracket, and wedge).
5. Prepare shuttering elements (props, bottom, sides, brackets, and wedge).
6. Erect shuttering in foundation (footing pad).
7. Erect shuttering in foundation beam.
8. Erect shuttering in column.
9. Erect shuttering for suspended floor.
10. Erect shuttering for superstructure beam.
11. Erect shuttering for wall.
12. Erect shuttering for junction (slab, beam, column, chhaja).
13. Dismantle beam/column/ slab shuttering.
14. Erect shuttering for a slab using steel members.

Task Analysis

Task No. 1. Develop concept of shuttering.

Time : 1 hr
Theory: 1 hr
Practical: hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Introduce the shuttering. 2. Explain importance of shuttering. 3. Explain functions of shuttering. 4. State types of shuttering. 5. Explain the results of good and bad shuttering works. 6. State general safety precautions in shuttering work. 7. Keep records.	**Condition (Given):** Classroom, books, notes and drawing **Task (What):** Develop the concept of shuttering. **Standard (How well):** Concept of shuttering developed.	➢ Shuttering and its use ➢ Types ➢ General safety precautions in shuttering works

Required tools/equipment: Chalk, Marker pen, white/ black board, notes/handouts etc
Safety:

Task Analysis

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Task No: **2. Interpret working drawings.**

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Distribute main drawing with working drawings of a simple structure at first e.g. Lintel. 2. Read various dimensions in the working drawing and comply with the dimensions in main drawing. 3. Find out external dimensions of the structure provided for which extra supports are necessary while building. 4. Interpret the drawing with the portion with already supports below them. 5. Introduce supports like- bottom, sides, and ends etc as the case may be. 6. State the main objectives of shuttering once again and its application in this example. 7. Keep records.	**Condition (Given):** Classroom/drawing room, main drawing of structure and its working drawing **Task (What):** Interpret working drawing of a lintel. **Standard (How well):** All the steps followed in sequence. Working drawing well interpreted.	➢ Types of drawing ➢ Main drawing, working drawing and their uses ➢ Scale used in drawings ➢ Lintel, tie beam column, slab and chhaja in main drawing and working drawing

Required tools/equipment: Teaching notes, main drawings, working drawings, marker/chalk, board, overhead if needed etc.

Safety:

Task Analysis

Task No: 3. Identify tools and equipment used for shuttering.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Display tools and equipment used in shuttering- Rip saw, cross cut saw, chisel, carpenter's hammer (claw hammer), folding scale, pencil, marking gauge, Basila, Craw bar, mallet, axe, plainer, oil stone, clamps, etc. 2. Explain their use and function. 3. Explain safety and precaution while using them. 4. Explain safety and maintenance of those tools and equipment. 5. Keep records.	**Condition (Given):** Tools and equipment used in shuttering works are displayed **Task (What):** Identify tools and equipment used fir shuttering. **Standard (How well):** All the steps followed in sequence. Tools and equipment used in shuttering identified.	➢ Different tools and equipment used in shuttering ➢ Care and maintenance, ➢ Safety and precautions in handling tools

Required tools/equipment: All tools and equipment displayed on bench in the class

Safety:

Task Analysis

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Task No: 4**. Identify elements of shuttering (Props, bottoms, sides, bracket, wedges etc).**

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain a detailed drawing of a shuttering showing different element of shuttering. 2. Draw sketches if needed to explain the elements. 3. Describe the quality and strength of the elements. 4. Visit actual site/inspect actual use of elements of shuttering if available and possible. 5. Identify each element of shuttering there and explain them. 6. Sketch the elements and explain their function in their report of field visit. 7. Keep records.	**Condition (Given):** Workshop/site and various elements of shuttering **Task (What):** Identify elements of shuttering. **Standard (How well):** All the steps followed in sequence. Elements of shuttering identified.	➢ List of element of shuttering ➢ Functions of each elements ➢ Requirement of each elements ➢ Report writing of site visit

Required tools/equipment: Detailed drawing of each element of shuttering, marker / chalk, board, nearby site visit etc**.**

Safety: Safety boots, safety helmets for site visit

Task Analysis

Task No: 5 Prepare shuttering elements (Props, bottom, sides, bracket, and wedge).

Time : 4 hrs
Theory: 2 hrs
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select timber / bamboo members for making element for shuttering. Inspect the site for fixing the height of props. 2. Study the drawing to find the numbers of props for a particular structure. 3. Cut props allowing topping on top and folding wedges at bottom for adjusting height. 4. Cut planks for bottom of beam equal to internal length of beam or lintel. 5. Select ply sheet / steel plates for slab bottom. 6. Select sides of slab/beam higher than its thickness. 7. Make brackets using strong and available timbers. 8. Use sides and projected topping as members of bracket and strengthen by providing a hypotenuse wooden members by nailing. 9. Cut about 100mm square timbers of convenient length diagonally to make folding wedges. 10. Prepare bottoms from ply wood / planks/ or any other suitable plain sheet. 11. Apply props to support bottoms with topping putting it against the grain. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, materials and drawing of a structure for fixing shuttering for first floor slab **Task (What):** Prepare props, bottom, sides, brackets and wedges. **Standard (How well):** All the steps followed in sequence. Props, bottom, side, bracket, wedges prepared as per drawing.	➢ Selection of materials for shuttering ➢ Timbers and sizes ➢ Bamboos and its size ➢ Steel plate / ply woods sheets ➢ Steel pipes / bamboos/ timbers for props, ➢ Wooden topping / channel beam for props ➢ End props topping with wooden members, steel channel beam ➢ Height adjustments, ➢ Lengthening wooden props

Required tools/equipment: cross cut saw, Axe, measuring tape, carpenter's hammer, craw bar etc.
Safety: Work in group as you require help from each others.

Task Analysis

Task No. 6. Erect shuttering in foundation (Footing pad).

Time : 4 hrs
Theory: 2 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Extend column center line from profile board. 2. Fix the center of a column from two side line extension, 3. Extend sides of column foundation from each profile board to find sides of the pad. 4. Plumb from the side lines extension to find sides of column foundation pad. 5. Square the column foundation pad sides now with builders square or by measuring diagonals. 6. Prepare sides member of the pad shuttering with plain timber of not less than 20mm thick. 7. Put two sides longer than the sides of the pad but other two sides must be just equal to the remaining sides of pad. 8. Adjust brackets outside the sides to erect and strengthen the sides. 9. Measure the diagonal of the square of the sides to check square ness. 10. Check the depth of the sides that the concrete has to form. 11. Mark with nails at sides the height or thickness of concrete to be formed. 12. Apply spacer from top of sides to keep correct size and strengthening the sides also. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** Trench plan, necessary tools, equipment, materials and detailed working drawing of a column **Task (What):** Erect shuttering in foundation for a pad footing. **Standard (How well):** All the steps followed in sequence. A shuttering for a pad footing erected as per drawing.	➢ Building profiles ➢ Center lines fixing using building profiles ➢ Use of Plumb bob ➢ Use of bracket to strengthen sides ➢ Use of spacers to hold sides ➢ Marking of thickness of concrete ➢ Safety precaution

Required tools/equipment: cross cut saw, folding tape, lines (cotton thread), hammer, pencil,
Safety: Use safety boots, helmets etc.

Task Analysis

Task No. 7. Erect shuttering in foundation Beam.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Excavate earth in between the columns for providing foundation beam up to the depth at which beam has to be provided. 2. Compact and consolidate the earth for beam portion. 3. Fill the excavated trench of the columns up to the bed of the foundation beam. 4. Compact and consolidate the refilled portion of the column trenches. 5. Fix sides of the beams vertical up to the height or more than required, 6. Provide brackets outside the sides to erect the sides. 7. Provide tops equal to beam width at certain interval in between the sides to keep beam with controlled. 8. Allow column verticality undisturbed at all junction of beams and columns. 9. Fix nails on the sides of shuttering for the height / depth of foundation beams to control regular depth of beams. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Trench plan, sectional drawing of foundation necessary tools, equipment and materials **Task (What):** Erect shuttering for foundation beams. **Standard (How well):** All the steps followed in sequence. Shuttering for foundation beams erected.	➢ Erath compaction ➢ Timber boards ➢ Leveling top of beams ➢ Centering the beams with the columns ➢ Procedure ➢ Safety precaution

Required tools/equipment: Cross cut saw, hammer, folding tape, crow bar, nails, rammers etc.
Safety: Ensure the earth below beam is well compacted and consolidated,

Task Analysis

Task No. 8. Erect shuttering in columns.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Fix the centers and sides of the columns. 2. Make starters of about 100mm high from the pad or slab or from where the columns have to erect for each column with the help of centering the columns and their sides. 3. Ensure that re-bars for the columns have been correctly placed and fixed before erecting shuttering for the columns. 4. Make cubes from cement concrete equal thickness to side covers for re-bars with tying binding wires on it. 5. Tie them on the stirrups from outside so that the cubes rest on sides of the shuttering. 6. Prepare colors at least two for each column to hold the sides vertical from outsides. 7. Prepare sides to give the widths of the columns of required heights making the two sides right angles, 8. Erect each right angled part resting against the starter and maintain verticality. 9. Adjust right angled sides making forma for the column and put colors from outside and tighten it. 10. Plumb all the sides of the forma, if possible from inside and if not from outside to ensure verticality of the columns. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, materials and drawing **Task (What):** Erect shuttering in columns. **Standard (How well):** All the steps followed in sequence. Shuttering for columns erected as per drawing.	➢ Centering and side fixing techniques for columns ➢ Plumbing techniques ➢ Colors and starters ➢ Cubes for cover to provide in columns, slabs and beams ➢ Safety precaution

Required tools/equipment: Cross cut saw, hammer, folding tape, crow bar, nails, line and pins, spirit level, chisels, rammers etc.
Safety: Ensure the verticality of all four sides of the column forma is ensured.

Task Analysis

Task No. 9. Erect shuttering for suspended floor.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Visit the site at first and familiarize the requirements of no. of props, and their various lengths. 2. Prepare props. 3. Prepare bottoms (boards) to required sizes. 4. Prepare prop tops (Flanges), 5. Prepare folding wedges. 6. Prepare supporting beams on which bottom board rests. 7. Erect props with top on which supporting beams rest. 8. Erect intermediate props to strengthen the supports. 9. Connect rows of props with ledgers. 10. Lay boards (planks / steel plates) of which the ends rest on beams laid on tops of props. 11. Fill the gaps in the boarding if any by providing pieces of boards. 12. Check the level of the bottom (top of board) by stretching thread and measuring the depth with measuring tape. 13. Provide a coat of oiling with grease oil or lay thin polythene paper on the board so that while the shuttering is taken out, the surface look smooth. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 16. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, materials and, drawing of the suspended floor and the site are supplied. **Task (What):** Erect shuttering for suspended floor. **Standard (How well):** All the steps followed in sequence. Shuttering for suspended floor erected as per drawing.	➢ Calculation of nos. of props ➢ Erection of shuttering of a suspended floor ➢ Leveling technique ➢ Different parts of shuttering, ➢ Characteristics of good shuttering. ➢ Safety precaution

Required tools/equipment: Cross cut saw, Crow bar, Chisel, pencil, folding tape, axe, hammer, nail puller, etc.
Safety: While erecting first prop with connecting beam, work with two or adequate number of people.

Task Analysis

Task No. 10. Erect shuttering for superstructure beam.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare bottom of the beam to be made shuttering. 2. Prepare props with toppings on them of equal height as it is a shuttering in superstructure beam. 3. Prepare sides higher than the depth of the beam, from planks / boards. 4. Prepare brackets. 5. Erect props at the ends of the beam first. 6. Erect prop in such a way that topping project outside the beam. 7. Provide shoring to the erected prop so that it stands straight and strong. 8. Lay bottom of the beam on top of the Joists which rest on toping (beam) of props and make sure that the bottom has rested firmly. 9. Erect sides on the laid bottom of the beam and support with bracket from outside. 10. Provide spacer made of wood/ timber equal to beam width, from inside the sides and above the top of beam and nail in position after putting re-bars of the beams. 11. Check that the beam bottom is at dead horizontal. 12. Check the sides of the beam truly vertical at their positions. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, materials and drawing of superstructure beam **Task (What):** Erect shuttering for superstructure beam. **Standard (How well):** All the steps followed in sequence. Shuttering for a super structure beam erected as per drawing.	➢ Calculation of nos. of props ➢ Erection of shuttering for a beam ➢ Leveling technique ➢ Different parts of shuttering ➢ Characteristics of good shuttering ➢ Procedure ➢ Safety precaution

Required tools/equipment: Cross cut saw, folding tape, pencil, axe, Basila, hammer, etc.
Safety: Work in group with understanding each other and the work.

Task Analysis

Task No. 11. Erect shuttering for wall.

Time : 7 hrs
Theory: 1hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare sides for both side of the given wall if it has two sides or one as the case may be, for a wall as given in drawing. 2. Prepare ledgers to hold the sides together. 3. Prepares timber shoring members to hold the sides of wall. 4. Prepare wooden cleats to hold the shoring members in position on top of concrete. 5. Prepare re-bar spacers equal to the thickness of wall, to provide in between two sides of the wall. 6. Put re-bar spacers at adequate distances simply to maintain wall thickness. 7. Erect sides of the wall standing right on its position and make it truly vertical. 8. Fix the side now with shoring members which rest on cleat on floor nailed into concrete. 9. Provide ledgers at top and middle so that shoring member can rest of them. 10. Do the same for the other side of the wall. 11. Check once again the verticality of the sides and wall thickness gap in between the sides. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, materials and drawing of the wall **Task (What):** Erect shuttering for wall. **Standard (How well):** All the steps followed in sequence. Shuttering for a wall erected as per drawing.	➢ Function of ledger Function of shoring ➢ Functions of cleats ➢ Techniques of erecting shuttering sides of a wall ➢ Safety precaution

Required tools/equipment: Cross cut saw, folding tape, pencil, axe, Basila, hammer, etc.
Safety: Ensure that the sides of the shuttering stand strong and upright while concreting and compacting.

Task Analysis

Time : 13 hrs
Theory: 1 hr
Practical: 12 hrs

Task No. 12. Erect shuttering for a junction as Project work. (Slab, beam, column, chhaja). ***Project work***

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare props with toping and wedges or sole plates if required. 2. Prepare sides for beams, columns, slab, and chhajas. 3. Prepare bottoms for beams, slabs and chhajas. 4. Prepare collars for columns. 5. Prepare cubes of end cover sizes. 6. Prepare starters for columns. 7. Erect props at the ends of beams. 8. Put bottom on top of toping of props. 9. Provide intermediate props too, 10. Fix bottoms of beams, slabs, and chhajas. 11. Fix sides of beams, slab, chhajas 12. Use brackets to fix beam sides. 13. Use side spacer for a beam if necessary. 14. Mark the height of the beam on its sides, 15. Put bottoms of slab on top of timber beam placed on flange of props. 16. Ensure the props are adequate to support working people on it. 17. Proved bottoms of chhajas on timber beam which has rested on toping / flange of props. 18. Mark the top of the finishing product on sides of beam/ slab/ chhajas. 19. Ensure that props have been adequately provided to bear working people' load, materials load etc. 20. Clean all tools & equipment & put at proper place 21. Clean working place. 22. Keep records.	**<u>Condition (Given)</u>:** Site/workshop, necessary tools, equipment, materials and drawing **<u>Task (What)</u>:** Erect shuttering for a junction as Project work. **<u>Standard (How well)</u>:** All the steps followed in sequence. Shuttering for a junction as provided in drawing erected.	➢ Levels of slab, beam and chhajas ➢ Columns heights and slab or beam junction ➢ Procedure ➢ Safety precaution

Required tools/equipment: Cross cut saw, folding tape, pencil, axe, Basila, hammer etc.
Safety: Junction is a crucial part of structure and is usually difficult in making shuttering, so work in group.

Task Analysis

Task No. 13. Dismantle beam/column/slab shuttering.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Apply ladder / trestle or scaffolding if it is already there. 2. Remove those last members fix during erecting. 3. Put the unfixed member in a proper place. 4. Remove sides for a beam at first. 5. Remove upper collars of columns at first. 6. Remove sides of slabs at first. 7. Remove bottoms of beams and slab only after 21 days of curing. 8. Remove bottom of slab first before removing bottom of beams. 9. Remove alternative props of slab, 10. Remove bottom of beam after 28 days curing. 11. Remove alternative props of beam also. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** A shuttering of slab, beam columns site necessary tools, equipment and materials **Task (What):** Dismantle beam/column/slab shuttering. **Standard (How well):** All the steps followed in sequence. Beam, slab and column shuttering removed.	➢ Strength development time of concrete ➢ Knowledge of shuttering procedure ➢ Safety precautions in handling shuttering members ➢ Safety precaution

Required tools/equipment: Claw hammer, Crow bar, Chisel etc.
Safety: Safety boots, safety helmets, safety precautions

Task Analysis

Task No. 14. Erect shuttering for a slab using steel members.

Time : 7 hrs
Theory : 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Inspect the steel members for shuttering like channel beam, props, steel plates etc. 2. Study drawing for the specification required for shuttering. 3. Collect required number of props @ at least two for a channel beam. 4. Collect required number of steel plates based upon the size of the plate and the area to have shuttering. 5. Collect required number of steel channel for the area. 6. Mark the distance at which steel channels have to be erected. 7. Erect steel props on the lines supporting steel channel on which steel plates rest. 8. Ensure that the props have base plates so that it does not be inserted. 9. Adjust height of the props to fit the plate's surface for the soft-fit of the ceiling by screwing up or down and holding by the bolt of the prop. 10. Prepare timber board for the area not covered by steel plates because of the size of the plates. 11. Block the holes if any found on the surface made by plates. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop/site, steel props, channel and plates, necessary tools, equipment and materials **Task (What):** Erect shuttering for a slab using steel members. **Standard (How well):** All the steps followed in sequence. Shuttering for a slab using steel members erected.	➢ Use of steel props with screws and bolts ➢ Use of steel props elongated by sliding and hooking with bolts

Required tools/equipment: pliers, crow bars, picks, shovels, measuring tape, water level pipe, spirit level, cross cut saw, hammer etc.
Safety: Wear safety boots and safety helmets.

Module Code: M 2
Sub module Code: SM 2.2
Sub module Title: Scaffolding

Description

This sub module is designed to equip trainees with the knowledge and skills on scaffolding related to temporary construction. The course focuses dependent and independent bamboo and wood arrangement as well as tubular type scaffolding erection as temporary constructions for the building and other structure of constructions

Duration: 70 hours

Competencies in Scaffolding

1. Develop concept of scaffolding.
2. Identify elements of scaffolding.
3. Prepare ladder.
4. Prepare lager, transom, standard, brace.
5. Prepare base plate, toe-board, and wooden board.
6. Tie lager, standard, and transom with jute rope.
7. Erect ladder/trestle scaffold.
8. Erect bamboo/timber used dependent scaffold.
9. Erect bamboo/timber used independent scaffold
10. Erect staging scaffold.
11. Erect putlog scaffold.
12. Erect cantilever type bamboo/timber scaffold.
13. Erect tubular simple tower scaffold.
14. Erect/assemble mobile tower scaffold (steel).
15. Dismantle cantilever scaffold (bamboo/wooden).
16. Dismantle tubular simple-tower scaffold.

Task Analysis

Time : 1 hr
Theory: 1 hr
Practical: hrs

Task No. 1. Develop concept of scaffolding.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Explain concept of scaffolding. 2. Explain the uses of scaffolding. 3. Explain the types of Scaffolding. 4. Explain the importance of safety precautions in making and using scaffolding. 5. Explain maintenance of scaffolding. 6. Keep records.	**Condition (Given):** Class, books, notes with various maps of scaffolds **Task (What):** Develop concepts of scaffolding. **Standard (How well):** Concepts of scaffolding developed.	➢ Introduction ➢ Types ➢ Uses ➢ Maintenance

Required tools/equipment:

Safety:

Task Analysis

Time : 2 hrs
Theory : 1 hr
Practical: 1 hr

Task No. 2. Identify elements of scaffold.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Identify the following elements of a scaffold- Standards, Ledgers, Transoms, Toe board, Hand rail, Ladder, Braces, Planks, Trestle, Working platform, Base plate. 2. List the function of each tool. 3. Keep records.	**<u>Condition (Given)</u>:** Classroom, books, drawing and handout **<u>Task (What)</u>:** Identify elements of scaffold. **<u>Standard (How well)</u>:** All the steps followed in sequence. Elements of scaffold identified.	➢ Importance uses of scaffold ➢ Elements of a scaffolds ➢ Materials uses in scaffold

Required tools/equipment:

Safety:

Task Analysis

Task No. 3. **Prepare a ladder.**

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1 Select proper strong timbers or bamboo for making ladder. 2 Select two long members to reach the working platform from the ground at a pitch of 60^0. 3 Select the two members which should not be less than 100 mm diameter and they should be strong enough to bear load coming on them. 4 Prepare rungs just over the width of the step desired in a desired numbers from not less than 100dia bamboo or log. 5 Lay them on a flat ground parallel to each other at a distance required as width of the ladder. 6 Put steps (rungs) on them at not less than 200mm rise and tighten with jute ropes. 7 Make sure the standing toes of the ladder resting on do not slip out. 8 Provide hand rail for the ladder if it is fixed. 9 Rest the upper end of the ladder on the edge of working platform and tighten with rope. 10 Provide handrail at the working platform. 11 Clean all tools & equipment & put at proper place 12 Clean working place. 13 Keep records.	**Condition (Given):** Workshop/site, necessary tools, equipment and materials **Task (What):** Prepare a Ladder. **Standard (How well):** All the steps followed in sequence. A ladder prepared as per required.	➢ Introduction to a ladder, its use, and requirements ➢ Preparation procedure

Required tools/equipment: Axe, Cross cut saw, Basila, Chisel, Hammer,
Safety: Do not chisel or cut in between the member for inserting rungs into the main ladder members or for any other reason.

Task Analysis

Task No. 4. Prepare ledger, Transom, Standards, Brace.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select the materials to make ledger, transom, standards and or brace. 2. Select bamboo of not less than 75mm diameter for making ledger and brace. 3. Ensure that the materials for ledger, brace, transom and standards should be matured and well grown. 4. Select straight, undamaged, and regular in size. 5. Select timbers for making standards, ledger, transoms and brace only from those of log not less than 100mm diameter. 6. Inspect that the members have not been cut anywhere in between its ends. 7. Inspect if the Bamboo members are trimmed beyond node which when used to stand on it, tears out. 8. Trim off the smaller parts to prepare ledger, standard, transom and braces, 9. Cut to the required length for ledger, standards, braces and transoms. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop/site, necessary tools, equipment, materials that are likely to be made ledgers, standards, transoms and braces **Task (What):** Prepare ledger, Transom, Standards, Brace. **Standard (How well):** All the steps followed in sequence. Ledgers, standards, braces and transoms prepared.	➢ Characteristics of good and strong materials like bamboo and timber logs ➢ Preparation procedure ➢ Safety precautions

Required tools/equipment: Axe, Cross cut saw, Basila, Measuring tape, Chisel, hammer, Mallet.
Safety: Wear safety boot.

Task Analysis

Task No. 5**.Prepare base plate, toe board, and wooden board.**

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare base plate from hard wood like sal shishau etc. 2. Prepare base plate should thick enough to bear loads coming through standards. 3. Prepare toe board of 20mm thick which helps protecting any fall outs from the working platform. 4. Prepare wooden boards that are laid on transoms that are placed at various distances of putlogs (Transoms). 5. Prepare wooden boards of finished squarely. They should rest on putlog. 6. Clean all tools & equipment & put at proper place 7. Clean working place. 8. Keep records.	**Condition (Given):** Workshop/site, necessary tools, equipment, wooden boards of various thicknesses are available to make base plate, toe board and wooden board **Task (What):** Prepare base plate, toe board, and wooden board. **Standard (How well):** All the steps followed in sequence. Base plate, toe board and wooden board prepared.	➢ Introduction to base plate, toe board and wooden board used in scaffold ➢ Preparation procedure ➢ Safety precaution

Required tools/equipment: Axe, Cross cut saw, Basila, Measuring tape, Chisel, hammer, Mallet.
Safety: Use safety boot.

Task Analysis

Task No. 6. Tie ledger, standard, and transom with jute rope.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select tying materials like Jute ropes, nylon ropes, cotton ropes or any other made of strong materials. 2. Obtain the selected bamboo or timber members for tying purposes. 3. Lay them on the flat ground and show tying them as if they are in position either in scaffold or in shuttering. 4. Demonstrate tying technique by tying any two or three members together. 5. Clean all tools & equipment & put at proper place 6. Clean working place. 7. Keep records.	**Condition (Given):** Workshop/site, necessary tools, equipment, ledgers, standards, transoms members are provided for practicing tying knots **Task (What):** Tie ledger, standard, and transom with jute rope **Standard (How well):** All the steps followed in sequence. Ledger, standards and transoms tied.	➢ Various techniques of tying transom, standard and ledger ➢ Procedure ➢ Safety precaution

Required tools/equipment: Scissors.

Safety: Wear safety Boot.

Task Analysis

Time : 4 hrs
Theory : 0.5 hr
Practical: 4.5 hrs

Task No. 7. Erect ladder / trestle scaffold.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select ladder making materials or trestle making materials. 2. Estimate the length of ladder required for a pitch of $60^{0.}$ 3. Prepare ladder as stated earlier. 4. Select timber materials to make two four legged trestle on which planks rest and working platform becomes. 5. Cut 4x2 1m long timber legs and 7x2 equal tying members to make two trestles. 6. Tie two legs together at top and at 250mm above the other ends (Bottom) with tying members. 7. Repeat the same for other part of the trestle and other trestle also. 8. Join the two assembled part to give shape of a four legged table. 9. Apply the two tables to support planks making working platform. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop/site, necessary tools, equipment, timbers members of required size e.g. 75mm x 75mm and drawing are made available **Task (What):** Prepare Trestle scaffold. **Standard (How well):** All the steps followed in sequence. Trestle scaffold prepared.	➢ Use of trestle and its make ➢ Timber sizes and timber joints

Required tools/equipment: Cross cut saw, Rip saw, Chisel, Hammer. Mallet, Pencil, gauge box etc.

Safety: Use the two tables to stand on fairly flat surface and put planks reaching to both ends.

Task Analysis

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Task No. 8. Erect bamboo / Timber used dependent scaffold.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select materials for making scaffold. 2. Erect standards just a meter away from the structure for which scaffold has to be erected. 3. Erect the standards at distance of about 2m from each other or equal to planks lengths. 4. Provide ledgers at about 1m from the ground level and tie tightly with the standards. 5. Provide another row of ledger at which working platform has to be made. 6. Put transoms stretching from putlog holes to standards and ledger joints if it is working level. 7. Tie the transoms behind the wall with a horizontal members laid. 8. Provide Brace at any angle to hold from top to bottom and from left to right holding at least three or more standards. 9. Provide handrail at about 900mm from the working platform for safe working. 10. Attach a ladder up to the working platform from the ground or next below landing. 11. Provide a toe board around the working platform to secure kick off pieces while working. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** A site requiring a scaffold, necessary tools and prepared materials for making bamboo dependent scaffold and drawing are made available **Task (What):** Erect bamboo / Timber used dependent scaffold. **Standard (How well):** All the steps followed in sequence. Timber or bamboo used dependent scaffold erected as per drawing.	➢ Good materials for making scaffold ➢ Requirements of a scaffold ➢ Rope tying techniques ➢ Safety precautions in maintaining scaffold

Required tools/equipment: Cross cut saw, chisel, Hammer, Mallet, measuring tape, axe, Jumpers
Safety: Work in group as it need helps from each other.

Task Analysis

Task No. 9. **Erect bamboo / Timber used independent scaffold**.

Time : 7 hrs
Theory : 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare scaffold making bamboo / timbers. 2. Mark the position at least 300mm away from the face of the structure for internal row of standards. 3. Prepare the positions at least 1 to 1.2m away from the internal standards for external standards. 4. Lay base plate over leveled ground stand on standards for both external and internal row of standards. 5. Estimate the numbers of standards so that immediate two have space equal to the length of planks (2m) to be used. 6. Erect standards on both external and internal row of standards. 7. Provide transoms to tie internal and external standards making a frame. 8. Provide ledgers to hold row of standards horizontally at every 1.5m high. 9. Tie standards, transom and ledger together using jute rope. 10. Brace row of standards at an inclined position holding all standards of one row together. 11. Provide cross brace at each cross standards. 12. Lay planks to make working platform tying both ends by rope. 13. Provide toe board around the working platform. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 16. Keep records.	**Condition (Given):** A structure around which independent scaffold is to be erected, necessary tools, equipment, materials and drawing and drawing are made available **Task (What):** Erect bamboo / Timber used independent scaffold. **Standard (How well):** All the steps followed in sequence. An independent scaffold of timber/bamboo erected as per drawing.	➢ Types of scaffolds ➢ Safe working platform ➢ Safe working condition

Required tools/equipment: Axe, Cross cut saw, Jumper
Safety: Use jute rope to tie members.

Task Analysis

Time : 5 hrs
Theory : 1 hr
Practical: 4 hrs

Task No. 10. Erect staging scaffold.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Level and compact the ground on which staging has to be constructed. 2. Provide base plate for each row of standards. 3. Erect strong standards at least three in one row making a rectangular platform. 4. Provide ledgers at every 1.5m height. 5. Provide braces to hold the two rows and other to hold the three standards together. 6. Make stages at every 1.5 m high to work temporarily or as per requirements. 7. Provide a ladder from one stage to another if required. 8. Tie the stage with transoms at every 3m with the structure. 9. Provide handrail at every working stages to secure safety for the workers. 10. Provide handrail at the topmost stages too. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** A working platform, necessary tools, equipment, materials and drawing are made available **Task (What):** Erect staging scaffold. **Standard (How well):** All the steps followed in sequence. Staging scaffold erected as per drawing.	➢ Introduction to temporary structures. ➢ Introduction of staging scaffold ➢ Erection procedure ➢ Use and safety for workers

Required tools/equipment: Axe, Cross cut saw, picks, shovel, crow bar, knife.
Safety: Tying is crucial as the structure stand as stage all on tying.

Task Analysis

Task No.11 Erect putlog scaffold.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Level the ground on which sole plate has to come over. 2. Put sole plate in necessary on which standards have to stand on. 3. Erect standards at convenient distances. 4. Provide ledger at about 1.5 to 2m high from the ground. 5. Provide ledger just in front of an opening through which horizontal tie can be tied up with internal standard behind the structure. 6. Provide ledger at which level putlogs have to be provided. 7. Provide putlogs members which pass through putlog holes and rest on ledger provided at the same level. 8. Tie them with ropes if they are all bamboo or timbers but if they are tubular members use couplings to putlogs and standards and ledgers. 9. Extend standards up to 900mm above working platform to provide handrail. 10. Lay scaffold boards on top of putlogs. 11. Tie all standards in row with a diagonal brace. 12. Provide toe boards around the working platform and fix them to standards. 13. Clean all tools & equipment & put at proper place 14. Keep records.	**Condition (Given):** A structure to which a putlog scaffold can be erected to work at high level, necessary tools, equipment, materials and drawing are made available **Task (What):** Erect putlog scaffold. **Standard (How well):** All the steps followed in sequence. A putlog scaffold erected as per drawing.	➢ Concept of Tubular scaffold ➢ Putlog scaffold and its use ➢ Different coupling used in tubular scaffolding ➢ Different elements of tubular scaffold

Required tools/equipment: Ladder, wrenches, cross cut saw for bamboo and timber members. Ropes or couplings, jumper or crow bars.
Safety: precautions while handling tubes, use safety boots and gloves.

Task Analysis

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Task No. 12. Erect Cantilever type bamboo/ Timber scaffold(project work)

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select bamboo or timber for erecting cantilever type scaffold. 2. Prepare members for making brackets. 3. Fix standards inside the structure with horizontal member- one at bottom and the other at 1.5 m above the bottom. 4. Tie those horizontal ties with standards erected from the edge of platform tied with lower horizontal tie and diagonal of the bracket. 5. Erect this type of cantilever at every 1.5m distance center to center. 6. Lay scaffold boards on the lower horizontal ties and tie them with the horizontal ties using ropes. 7. Pin the diagonal member of the bracket at cleat fixed on the wall. 8. Provide handrail at about 900mm high from the working platform. 9. Provide toe board around the working platform. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** A structure for external maintenance or repair that requires a cantilever scaffold, necessary tools, equipment, materials and drawing are made available **Task (What):** Erect Cantilever type bamboo/ Timber scaffold. **Standard (How well):** All the steps followed in sequence. Cantilever type scaffold with bamboo and or timber erected as per drawing.	➢ Needs of cantilever type scaffold ➢ Different parts of cantilever type scaffold ➢ Construction of cantilever type scaffold from bamboo and or timber ➢ Safety precaution

Required tools/equipment: Axe, Cross cut saw, Ladder, cleats,
Safety: Precautions are necessary in erecting cantilever type scaffold as it need works at high level.

Task Analysis

Task No.13. Erect Tubular simple tower scaffold .

Time :5 hrs
Theory: 1 hrs
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Ensure platform area required to erect in tower scaffold. 2. Place sole plate on leveled ground to required sizes (length and breadth). 3. Place base plate on sole plate to stand standards. 4. Erect standards on base plates and immediately tie them to stand... 5. Tie the standards with horizontal members at top of the standard using couplings. 6. Provide brace, holding the standards at diagonally. 7. Provide cross brace holding inner and outer standards. 8. Extend standards either with coupling pin inserting on the top of standard and the extending member coming on coupling pin. 9. Provide transoms over horizontal members to receive boards. 10. Make working platform laying scaffold board, resting on transoms members. 11. Provide guardrail at about 90cm from the working platform. 12. Provide toe board a round the working platform. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** Required scaffold stated in instruction, tubular members and coupling necessary tools, equipment, materials and drawing are made available **Task (What):** Erect Tubular simple tower scaffold. **Standard (How well):** All the steps followed in sequence. Tubular simple tower scaffold erected as per drawing.	➢ Metal tubes and their sizes, and different couplings ➢ Various elements of simple tower scaffold ➢ Rules and regulations ➢ Safety precaution

Required tools/equipment: Wrench, Crow bar
Safety: Use safety boot and helmets.

Task Analysis

Task No. 14. Erect / assemble mobile tower scaffold.

Time : 5 hrs
Theory: 1 hrs
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Collect necessary members for assembling mobile tower scaffold. 2. Erect built-in frame for one side of mobile tower by locking its rollers at bottom. 3. Hold straight the frame while erecting other side of mobile tower. 4. Stop the rollers of the frame. 5. Lift the horizontal frame and fit into the standards erected on rollers. 6. Place scaffold board on the horizontal frame and tie using tie clip on the frame members. 7. Tie braces diagonally. 8. Extend the standards to raise height using coupling pin to fit on to standard. 9. Fix horizontal frame again to making working platform as before. 10. Ensure that the roller lock should lock rolling properly. 11. Unlock the lock only when to move from one place to another on a fairly plain area only. 12. Use or assemble it only for small area to move around. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** Prefabricated metal members to erect a mobile tower scaffold, necessary tools, equipment, materials and drawing are made available **Task (What):** Erect / assemble mobile tower scaffold. **Standard (How well):** All the steps followed in sequence. Mobile tower scaffold of given height assembled as per drawing.	➢ Identification of different types of prefabricated members, coupling and accessories of mobile tower scaffold ➢ Technique of assembling ➢ Safety precaution

Required tools/equipment: Wrench, Pliers, Hammer.
Safety: Wear safety boot, safety helmet.

Task Analysis

Task No. 15. Dismantle cantilever scaffold (bamboo/wooden).

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Dismantle the last assembled knot first. 2. Take out the last put member while assembling or fixing. 3. Loosen the tie that was tied at the end of erecting the scaffold. 4. Take out standards erected above bracket. 5. Take out scaffold boards. 6. Remove bracket. 7. Remove inner standards. 8. Remove top putlog member. 9. Remove inside standards. 10. Take out lower putlogs. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Erected cantilever scaffold, necessary tools, equipment, and materials are made available **Task (What):** Erect / assemble mobile tower scaffold **Standard (How well):** All the steps followed in sequence. Cantilever scaffold built with bamboo / timber dismantled as per drawing.	➢ Dismantling process of cantilever scaffold ➢ Safe landing of members and fittings

Required tools/equipment: Knife.

Safety: Safety helmet, safety boot

Task Analysis

Task No.16 Dismantle tubular simple –tower scaffold.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Take out handrail. 2. Take out toe board. 3. Remove scaffold boards. 4. Take out transoms. 5. Take out horizontal members. 6. Unlock top coupling of diagonal brace. 7. Unlock top coupling of cross brace. 8. Remove ledgers. 9. Remove extended standards if any. 10. Remove lower ledger and diagonal braces. 11. Remove cross braces. 12. Take out standards from base plates. 13. Remove sole plate if provided. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 16. Keep records.	**Condition (Given):** An erected tubular tower scaffold, necessary tools, equipment and materials are made available **Task (What):** Dismantle tubular simple –tower scaffold. **Standard (How well):** All the steps followed in sequence. Tubular simple –tower scaffold dismantled.	➢ Process of erecting tubular simple tower scaffold ➢ Safe landing of members and fittings

Required tools/equipment: Wrench, Pliers.

Safety: Wear safety boot, safety helmet, safety gloves.

Module Code: M 2
Sub module Code: SM 2.3
Sub module Title: Bar Bending

Description
This sub module is designed to equip trainees with the knowledge and skills on bar bending works of Reinforced Cement Concrete structures. The course focuses interpretation of bar bending schedule bar bending, bar binding and bar placing of beams, slabs and columns of Reinforced Cement Concrete structures.

Duration: 70 hours

Competencies in Bar Bending

1. Develop the concept of reinforcement
2. Identify commonly available reinforcements.
3. Interpret bar bending schedule
4. Measure/cut steel bars
5. Bend hooks.
6. Bend cranks (30/45).
7. Bend column legs.
8. Bend stirrups.
9. Bend helical stirrups.
10. Bend lap length of re bars for slab/column.
11. Arrange/bind mat foundation with column bars.
12. Arrange re bars for doubly reinforcements.
13. Bind re bars for doubly reinforcements.
14. Bind re bars in slab/beam/column.
15. Arrange/bind re bars for column leg bars and stirrups.
16. Place column bar in mat foundation.
17. Maintain end cover /bottom cover.
18. Assemble re bar for beam.
19. Place assembled beam re bar.
20. Arrange beam bars with column re bar
21. Place main bars, distribution bars in simply supported slab.
22. Place main bars, distribution bars in cantilever slab.
23. Carry out re bar arrangement for aground water tank.

Task Analysis

Task No. 1. Develop the concept of reinforcements.

Time : 1 hr
Theory: 1 hr
Practical: hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. State the purpose of providing reinforcements. 2. Describe reinforcing materials commonly used in construction works. 3. Inspects the reinforcement's materials and binding wires. 4. State the types of steel reinforcement available in the market. 5. Enlist good characteristics of steel reinforcements. 6. Describe the defects commonly available in steel reinforcements. 7. Keep records.	**Condition (Given):** Classroom, books and class note **Task (What):** Develop the concept of reinforcements. **Standard (How well):** Concepts of reinforcements developed.	➢ Definition of reinforcement ➢ Needs of Reinforcement in construction ➢ Nature of reinforcements ➢ Positions of reinforcements in concrete ➢ Shapes of reinforcements

Required tools/equipment:
Safety:

Task Analysis

Task No. 2. Identify commonly available reinforcements.

Time: 2 hr
Theory: 1hr
Practical: 1hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Identify commonly available steel reinforcement in Nepal. 2. Describe the strength of different steel reinforcements. 3. Enlist characteristics of plain round steel reinforcements. 4. State tore-steel bars with its types and strength. 5. Describe deformed bar with its type and strength. 6. State square bars and their uses, 7. State flat bars and their uses. 8. Keep records.	**Condition (Given):** Workshop and commonly available steel reinforcing specimens are displayed **Task (What):** Identify commonly available reinforcements. **Standard (How well):** All the steps followed in sequence. Commonly available reinforcements identified.	➢ Types of steel reinforcements ➢ Placement of re-bars in slab and beam

Required tools/equipment:

Safety:

Task Analysis

Task No. 3. Interpret Bar Bending schedule.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Identify bar marks provided in structural drawing. 2. Identify bar –bends. 3. Identify the dimensions of different shapes of bar bends. 4. Interpret accurately the given bar-schedule. 5. Prepare a bar schedule from a given structural drawing. 6. Keep records.	**Condition (Given):** Classroom and a simple structure drawing and a bar schedule of a structural drawing **Task (What):** Interpret bar bending schedule. **Standard (How well):** All the steps followed in sequence. Bar bending schedule interpreted.	➢ Bar marks and its uses ➢ Tabulation of steel reinforcement ➢ Calculation of bar lengths of hook and bent-ups

Required tools/equipment:

Safety:

Task Analysis

Task No. 4. Measure / cut steel bars.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Find the number and sizes of reinforcements from the given structural drawing. 2. Calculate the total lengths of the bars. 3. Measure the bar and mark the length with chalk or pencil. 4. Cut the measured bars in required lengths. 5. Stack the cut bars separately at side. 6. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and a structural drawing **Task (What):** Measure/ cut steel bars. **Standard (How well):** All the steps followed in sequence. Steel bars measured and cut into required size.	➢ Structural drawing ➢ Length calculations of different steel bars ➢ Bar marks used in bar schedule ➢ Cutting of steel bars

Required tools/equipment: hammer, chisels, Fork, Cutter machine, measuring tape, Chalk/Pencil.
Safety: When using chisels and hammers to cut steel bars that are held by another worker should be at right angle to each other.

Task Analysis

Task No. 5. Bend hooks (30'/45').

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Calculate the hook length. 2. Measure and mark hook lengths on the cut steel bar. 3. Use bar bending table to bend the bar. 4. Place the cut bar and adjust the mark on the sprouting nails on the bar bending table. 5. Apply bar bending rod (key rod) to bend the bar placed on the bar bending table. 6. Bend the bar slowly to the required bend. 7. Place the bent up bars at one place. 8. Clean all tools & equipment & put at proper place 9. Clean working place. 10. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and structural drawing **Task (What):** Bend hooks (30'/45'). **Standard (How well):** All the steps followed in sequence. Hooks on bars bent as per drawing.	➢ Calculation of Hook lengths ➢ Methods of measuring bars ➢ Bar bending table ➢ Bar bending method

Required tools/equipment: Measuring Tape, Chalk/Pencil, bar bending table, bending key rod,
Safety: Bend bar slowly so that crack on hook tension side does not occur.

Task Analysis

Task No. 6. Bend cranks.

Time : 2 hrs
Theory: 0.5hr
Practical: 1.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Calculate the crank length, 2. Mark the crank length on the given specimens, 3. Place the specimen on the bar bending table and adjust at its mark from where it has to bend, 4. Use bar bending key rod by keeping the bar in its groove. 5. Turn the bar bending key rod pressing down on the bar accurately to required direction making crank in the bar.	**Condition (Given):** Workshop, necessary tools, equipment, materials, drawing and bar specimens **Task (What):** Bend cranks. **Standard (How well):** All the steps followed in sequence. Steel bars cranked as per drawing.	➢ Crank length calculation ➢ Bending technique

Required tools/equipment: Measuring Tape, Chalk/Pencil, bar bending table, bending key rod
Safety: Bend bar slowly so that crack on hook tension side does not occur

Task Analysis

Task No. 7. Bend column legs.

Time : 2 hrs
Theory: 0.5hr
Practical: 1.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Interpret the shape of bars given in the drawing. 2. Calculate the total length of the bar, 3. Cut the bar to the total length calculated. 4. Mark the length of legs on the cut bars. 5. Place the bar on the bar bending table. 6. Adjust the mark of leg near the sprouting nail on the table from which it has to bend. 7. Put the bar bending rod with the bending rod holding in the groove and. 8. Turn the bar bending rod slowly sideways to bend the bar placed on the table. 9. Take out the bent up bars from the table and stack in a safe place. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials, bars of required sizes and lengths and structural drawing **Task (What):** Bend column legs. **Standard (How well):** All the steps followed in sequence. Column legs bent as per drawing	➢ Calculation of bar lengths and legs of the bar

Required tools/equipment: Measuring Tape, Chalk/Pencil, bar bending table, bending key rod
Safety: Use steel rod safely as long bars are difficult in handling.

Task Analysis

Task No. 8. Bend Stirrups.

Time : 3 hrs
Theory: 0.5 hr
Practical: 2.5hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select the re-bar from which stirrups have to be made. 2. Calculate the length of stirrup bar allowing 50mm hooking lengths. 3. Mark the length of stirrup bar for making stirrups. 4. Cut the stirrup bar length using cutter or Chisel and hammer in required pieces. 5. Mark the size of stirrup on the cut bars. 6. Put the bar on the bar bending table and adjust from where the bar has to be bent. 7. Use bar bending key keeping the bar in its groove and turn slowly bending to required degree. 8. Bend the stirrup bar at various bends to make a complete stirrup. 9. Bend the ends of the bar making hook and directing to the center of the member. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials, stirrup making bars and the structural drawing requiring stirrups **Task (What):** Bend Stirrups. **Standard (How well):** All the steps followed in sequence. Stirrups bent as per drawing.	➢ Introduction to stirrups, size and shapes, use and making ➢ Bending techniques

Required tools/equipment: Hammer, chisel, measuring tape, pliers, bar bending table, bar bending key, fork, hard stone.
Safety: Take care while cutting bars, especially when using chisel and hammer

Task Analysis

Task No. 9. Bend helical stirrups.

Time : 2 hrs
Theory: 0.5 hr
Practical: 1.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Mark the spacing of stirrups on the column or beam bars (usually it is provided in circular column which ahs minimum of six main bars). 2. Cut main bar spacers from inside the main bars. 3. Put the spaces at about 1 m center to center distance. 4. Calculate the total length of the stirrup to be surrounded around the column main bars from outside. 5. Put one end of the stirrup bar at the start point of the main bar and bound it with the main bars. 6. Maintain the spacing of the stirrup on the main bar at equal or required distances. 7. Bind the stirrups with the main bar at each contact with the main bars using binding wire. 8. Continue this process until the total height of the column completes. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials, steel bars, and structural drawing **Task (What):** Bend helical stirrups. **Standard (How well):** All the steps followed in sequence. Helical stirrups bent up around the main bar of a circular column as per drawing.	➢ Calculation of helical stirrup bar lengths for a particular number of stirrups ➢ Stirrup Bar marking technique

Required tools/equipment: Measuring tape, Binding wore, Cutter, hammer. Chisel.
Safety: Surrounding stirrup wire is a heavy work and hence takes helps.

Task Analysis

Task No. 10. Bend lap-length of re-bars for slab / column.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select the bar size to be provided for lapping. 2. Calculate the lap length for the required the size of bar. 3. Calculate hook length for the lapping bar if it is plain bar. 4. Cut the lapping bar with a length of lapping and hooking length as well. 5. Make hook for the lapping bar. 6. Bend the lapping bar just to give position to the extending bar. 7. Place the lapping bar on extending bar and bind with binding wire properly. 8. Bend the extending bar to make room for the lapping bar in it also. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials, bar for extending and lapping bar and structural drawing **Task (What):** Bend lap-length of re-bars for slab / column. **Standard (How well):** All the steps followed in sequence. Lap length of rebar for slab / column bent as per drawing.	➢ Calculate lap length on the basis of bar size ➢ Use of 18d for Hook length ➢ Extending bar bent and lapping bar bent for half a diameter from each of them

Required tools/equipment: bending key rod, Re-bar cutter, hammer etc.
Safety: Bind the lap length at least at two places on the lapping.

Task Analysis

Task No. 11. Arrange / Bind mat foundation with column bars.

Time : 4 hrs
Theory: 0.5 hr
Practical: 3.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Select required bar sizes after the study of structural drawing and bar schedule. 2. Cut the bars in required sizes as given in bar schedule both top and bottom bars. 3. Cut binding wire too. 4. Lat bottom bar in the foundation prepared ground at specified spacing. 5. Mark distribution bars on the laid bottom bars. (Usually foundation bars are in two way reinforcements). 6. Place the top bar (distribution bar) and tie using binding wire in their marked position. 7. Center the position of column on the mat foundation net. 8. Mark the position of column on the mat foundation. 9. Erect column bars on the mat foundation bar net with the leg extending over the mat. 10. Insert required stirrups round the column bars. 11. Center the column bars using ropes as shoring sideways. 12. Bind the column leg bars with the mat foundation. 13. Adjust the position of stirrup on the column bar and bind with column bars. 14. Clean all tools & equipment & put at proper place 15. Keep records.	**Condition (Given):** Site, bars of required size and structural drawing and bar schedule **Task (What):** Arrange / Bind mat foundation with column bars. **Standard (How well):** All the steps followed in sequence. Mat foundation with column bars arranged and bound as drawing and bar scheduke.	➢ Centering technique of columns ➢ Standing techniques of column bars

Required tools/equipment: Bar cutter, hammer, chisel, Wire binding key, scissors etc.
Safety: Center and hold column bars with their stirrups around them in positions using shoring ropes.

Task Analysis

Task No. 12. Arrange re-bars for doubly reinforcements.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Find the bar arrangement for doubly reinforcement from the structural drawing and bar schedule. 2. Select bar sizes as required for the bar arrangement for doubly reinforcements. 3. Calculate the bar lengths for different bar marks. 4. Cut the bars in to calculated length for each bar marks. 5. Bend hooks or crank bars if needed as per structural drawing. 6. Place main bottom bars in required spacing. 7. Mark top bar spacing on bottom main bars. 8. Place top main bars on the marked positions. 9. Bind them at their crossing using binding wire. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Site, necessary tools, equipment, materials, drawing and bar schedule for a doubly reinforcement slab **Task (What):** Arrange re-bars for doubly reinforcements. **Standard (How well):** All the steps followed in sequence. Reinforcement bars for doubly reinforcement provided as per drawing and bar schedule.	➢ Calculation of top and bottom main bars of a doubly reinforcement slab

Required tools/equipment: Bar cutter, hammer, chisel, Wire binding key, scissors etc
Safety: Use safety boots and globes while working with steel bars.

Task Analysis

Task No. 13. Bind re-bar for doubly reinforcements.

Time : 3 hrs
Theory: 0.5 hr
Practical: 2.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Ensure that top and bottom main bars have been placed accurately as given in the structural drawing and bar schedules. 2. Ensure that laps if any has adequate lap length, 3. Ensure that the end hooks of each bar have been turned inside the slab. 4. Ensure that bottom bars have been raised to allow bottom cover. 5. Ensure that end covers for each bar has been maintained. 6. Ensure that cranked bars have been provided distribution bars at both top and bottom. 7. Cut binding wire of at least 16 SWG to about 25omm long. 8. Double the 250mm long binding wire and insert them below the bottom bar and bring pup cross wise holding both bars and once again pass the wire from other cross and bring up both ends. 9. Apply binding key or a 50mm long nail to turn around to tighten the wire. 10. Tighten the binding wire holding both top and bottom crossing bars together. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Doubly reinforcement bars laid in position, necessary tools, equipment and materials **Task (What):** Bind re-bar for doubly reinforcements. **Standard (How well):** All the steps followed in sequence. Re-bars for doubly reinforcements bound.	➢ Bar binding technique using binding wire and binding key or nail

Required tools/equipment: Binding wire, Binding key or 50mm long nail, crow bar etc.
Safety: Use safety boots and hand gloves.

Task Analysis

Task No. 14. Bind re-bars in slab/beam/column.

Time : 6 hrs
Theory: 0.5 hrs
Practical: 5.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Cut 16 SWG MS wire into 250 to 300mm lengths. 2. Examine the re-bars placed on positions of specified distances. 3. Correct displaced bars if any. 4. Hold a piece of MS wire and fold it into half using a binding key. 5. Insert the folded wire underneath the crossing of two bars and bring the both ends up and again insert one of the ends from the other crossing and bring it up too. 6. Turn both ends together using the binding key to tighten the re-bars. 7. Tighten all the crossings of re-bars or overlapping of re-bars tightly. 8. Bind the overlapping at least at two places for one overlap. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Re-bars laid or arranged for a slab / beam/columns, necessary tools, equipment and materials **Task (What):** Bind re-bars in slab/beam/column. **Standard (How well):** All the steps followed in sequence. Re-bars in slab/beam/column bound.	➢ Bar binding techniques

Required tools/equipment: Scissors, crow bar, Binding key / Nail.
Safety: Use hand globes, safety boots.

Task Analysis

Task No. 15. Arrange/bind re-bars for column leg bars and stirrups.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Find the shape and nos. of column re-bars from the drawing. 2. Calculate the numbers of stirrup for the portion of column re-bar length. 3. Cut re-bars length equal to the length of leg plus the column height up to the next floor and lap lengths. 4. Lay column re-bars on a flat ground and insert stirrups of required number for the length of re-bars. 5. Mark the position of stirrups on re-bar starting from the leg bent. 6. Bind stirrups at their positions marked before. 7. Lift the column re-bar with others' help and lower slowly on to trench on which the column has to stand up. 8. Fix the center and sides of the column on the trench and adjust the column re-bar on it. 9. Plumb the re-bar for its verticality and center to center distance. 10. Use sideway ropes to hold the re-bars from different point so that it stands up straight. 11. Bind the legs of the re-bars with the foundation mat. 12. Use timber or bamboo too to keep the column re-bars straight till its concrete is set well. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** A trench and re-bars for column, necessary tools, equipment, materials, and structural drawing **Task (What):** Arrange/bind re-bars for column leg bars and stirrups. **Standard (How well):** All the steps followed in sequence. Re-bars for column legs and stirrups arranged and bound as per drawing	➢ Arrangement of column re-bars as per drawing

Required tools/equipment: Cutting machine, Chisel, Hammer, Scissors, Crow bar, Fork, ropes, Timber/bamboos etc
Safety: Use safety boot, gloves while working with re-bars.

Task Analysis

Task No. 16. Place column re- bar on mat foundation.

Time : 4 hrs
Theory: 0.5 hr
Practical: 3.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Fix the center line of column on its mat foundation from both sides using profiles. 2. Fix the sides of the column on mat foundation so that when placing column re-bar, the sides align with the sides marked. 3. Lower the re-bar prepared out of the trench. 4. Use timber / bamboo as support in lowering the re-bars. 5. Tie two or three ropes at the top of column re-bar. 6. Use crowbar or jumper to lift and adjust the legs of column re-bars until it is positioned on its right place. 7. Tighten the ropes fixed at top as sideways and pin up on right ground making the column re-bar straight upright. 8. Bind the column legs on to mat re-bars as usual. 9. Use bamboo or timber also to hold the column re-bar upright till the set of concrete without sagging at all. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Column re-bars prepared along with its stirrups bound in position, necessary tools, equipment, materials and its structural drawing **Task (What):** Place column re- bar on mat foundation. **Standard (How well):** All the steps followed in sequence. Column re-bar placed on mat foundation as per drawing.	➢ Handling of column re-bars

Required tools/equipment: Crow bar, Jumper, Timber/ bamboo members, Binding key, ropes, Knife, Iron or wooden pegs, hammer
Safety: Wear safety boots, safety gloves.

Task Analysis

Task No. 17. Maintain end cover / bottom cover.

Time : 3 hrs
Theory: 0.5 hr
Practical: 2.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Cut binding wires of 16 SWG in to 150mm length. 2. Fold them in to halves. 3. Prepare cement sand mortar of 1:4 or even rich for making cubes. 4. Prepare a fairly flat ground or concrete base or any other on which cement sand mortar of 1:4 is laid to the thickness of end cover. 5. Cut the laid mortar into 40 to 50 square divisions for making pieces. 6. Insert the folded part of the binding wire into each division and level and compact it. 7. Cure the cubes sufficiently to gain strength. 8. Take out the cubes and separate them. Now each of them has two wires coming out of it. 9. Bind the wire of the cubes on the outer re-bar of column, beam so that the rear part of the cube rest on shuttering inside face. 10. Provide end cover for slab by lifting the bottom bar and placing the cube underneath and bind the wire on to the reinforcement. 11. Repeat this to all external re-bars of column/ slab/ beam. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Re-bars of any structural member arranged in their positions, necessary tools, equipment, materials and structural drawing **Task (What):** Maintain end cover / bottom cover. **Standard (How well):** All the steps followed in sequence. End / bottom cover maintained as per drawing.	➢ Importance of end cover ➢ Techniques of maintaining end/ bottom cover

Required tools/equipment: Binding key, jumper or crow bar, Measuring tape.
Safety: Use hand gloves and safety boot.

Task Analysis

Task No. 18. Assemble re-bar for beam.

Time : 2 hrs
Theory: 0.5 hr
Practical: 2.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instruction. 2. Prepare rings (stirrups) for the beam. 3. Put total required number of stirrups on the base in the right positions. 4. Insert main bottom and top bars from one end of the beam. 5. Adjust re-bars of the beam correctly inside the stirrups and bind them with stirrup to make beam re-bar. 6. Prepare beam re-bar out of the base of beam in case it is at high or difficult to do so as in step no. 4. 7. Ensure that the base of the beam is leveled and without sagging at all. 8. Erect sides of the beam after pacing beam re-bar and assembling on its position. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Prepared re-bars for a beam, necessary tools, equipment, materials, and a drawing **Task (What):** Assemble re-bar for beam. **Standard (How well):** All the steps followed in sequence. Re-bars for beam assembled as per drawing.	➢ Techniques of assembling re-bars for a beam

Required tools/equipment: Crow bar, Ropes, Binding key, jumper.
Safety: Use safety gloves and safety boot.

Task Analysis

Task No. 19. Place assembled beam re-bar.

Time : 2 hrs
Theory: 0.5 hr
Practical: 1.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare beam re-bar out side the bottom of beam shuttering if it cannot be done so on the beam base directly. 2. Assemble beam re-bar as done before at the side of beam position in the structure. 3. Prepare beam bottom with working platform at the side of the beam. 4. Bind the assembled beam with ropes at both ends. 5. Lift the assembled beam with the help of rope from the working platform. 6. Place gently the assembled beam re-bar gently on the bottom of beam. 7. Adjust with crow bar in it needs. 8. Lift the assembled re-bar of a beam with a crane if possible and place in position. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** The beam shorter and smaller than the length of the structure, necessary tools, equipment, materials, and structural drawing of the **Task (What):** Place assembled beam re-bar. **Standard (How well):** All the steps followed in sequence. Beam re-bar assembled out of the position placed as per drawing.	➢ Lifting technique without distorting assembled rebar

Required tools/equipment: Rope, crane, timber or bamboo members, crow bar, Rope, crane, timber or bamboo members, crow bar, pipe rollers.
Safety: Use safety boot and gloves.

Task Analysis

Task No. 20. Arrange beam re-bars with column re-bars.

Time : 4 hrs
Theory: 0.5 hr
Practical: 3.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instruction. 2. Insert the beam re-bar through the column re-bars if the column is in the middle and but if it is at the end, insert the beam re-bars to flush the column re-bars. 3. Arrange beam re-bars to bend down in to the column if it is so designed. 4. Make sure that the steel in column does not make dense in such a way that aggregates do not pass through. 5. Bundle the re-bars of beam and column allowing spaces for passing aggregates. 6. Arrange beam re-bars first the bottom and then only the top re-bars. 7. Clean all tools & equipment & put at proper place 8. Clean working place. 9. Keep records.	**Condition (Given):** Existing column with beam to come over, necessary tools, equipment, materials, and structural drawing **Task (What):** Arrange beam re-bars with column re-bar. **Standard (How well):** All the steps followed in sequence. Beam re-bars arranged with column re-bars as per drawing.	➢ Spaces between re-bars ➢ Bundling of re-bars techniques

Required tools/equipment: Crow bar, binding wire, scissors, and jumper.
Safety: Use safety book and gloves.

Task Analysis

Time : 3 hrs
Theory: 0.5 hr
Practical: 2.5 hrs

Task No. 21. Place main bars/ distribution bars for a simply supported slab.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study the drawing and bar schedule of the given slab. 2. Prepare different re-bars of the slab. 3. Mark the placement position of main re-bars on the prepared form work. 4. Lay main re-bars on the mark just marked. 5. Mark the placement of distribution bars on main re-bars. 6. Lay the distribution bars on the mark marked just before on the main bars. 7. Check if any small re-bars is left out. 8. Check lapping and lap lengths. 9. Bind the crossing of main re-bars and the distribution bars using binding wire as before. 10. Provide distribution re-bars for both cranked re-bars and straight re-bars. 11. Use chairs in place of top and bottom main re-bars. 12. Provide end cover cubes prepared with cement sand 1:3 mortar and binding wire in it, as described earlier. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** Shuttering for the slab to lay re-bars, necessary tools, equipment, materials and drawing **Task (What):** Place main bars/ distribution bars for a simply supported slab. **Standard (How well):** All the steps followed in sequence. Main re-bars and Distribution re-bars placed for a simply supported slab.	➢ Calculation of re-bars numbers ➢ Marking bar spacing technique

Required tools/equipment: Chalk, Measuring tape, Binding key, Crow bar, scissors
Safety: Use safety Boot and hand gloves.

Task Analysis

Task No. 22 Place main bars and distribution bars for a cantilever slab.

Time : 3 hrs
Theory: 0.5 hr
Practical: 2.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study the drawing of a cantilever slab given. 2. Calculate the number and lengths of main re-bar of the cantilever slab. 3. Prepare the main and distribution bars for the slab. 4. Prepare chairs to keep the main re-bars in their position. 5. Inspect the formwork if it is ready for laying re-mars. 6. Mark the positions of main re-bars on the forma. 7. Lay the main re-bars as marked on the forma. 8. Mark the position of distribution bars on the main re-bars. 9. Lay the distribution bars below the main bars. 10. Put chairs underneath the main re-bar at least one per square meter. 11. Bind the crossing of main re-bars and the distribution bar using binding wire. 12. Bind laps and the chairs with the main re-bars and distribution re-bars also. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** A complete form work for a cantilever slab is ready for laying re-bars, necessary tools, equipment, materials a bar schedule and structural drawing of the slab **Task (What):** Place main bars and distribution bars for a cantilever slab **Standard (How well):** All the steps followed in sequence. Main bars and distribution bars for a cantilever slab placed as per bar schedule and drawing.	➢ Functions placement of cantilever bars ➢ Use and shape of chairs

Required tools/equipment: Binding key, measuring tape, crow bar, hammer, scissors.

Safety: Use safety Boot and hand gloves.

Task Analysis

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Task No. 23. Carry out re-bar arrangement for a ground water tank (project work).

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study the structural drawing and bar schedule for different types of reinforcements. 2. Prepare all types of re-bars used or given in the drawing and bar schedule. 3. Mark the positions of main re-bars of base slab. It may be doubly reinforcements slab. In that case, lay bottom re-bars and then top re-bars. Use chairs to keep top bars in position. 4. Check re-bars for walls. The length of wall re-bar may be different. 5. Mark the position of one set of re-bars. 6. Place them in position and inserting their leg into the base slab. 7. Now mark other types of re-bars of the wall. 8. Place them in between the first placed re-bars. 9. Note that the wall may have doubly reinforcement wall. 10. Place first the outer re-bars and then inner re-bars. 11. Place separators in between outer and inner re-bar. 12. Provide distribution bars from inside of outer re-bars and bind them. 13. Provide distribution bar for inner re-bar from inside and bin them. 14. Keep records.	**Condition (Given):** Ground water tank has bottom PCC slab to take RCC slab ready, necessary tools, equipment, materials and drawing and bar schedule **Task (What):** Carry out re-bar arrangement for a ground water tank. **Standard (How well):** All the steps followed in sequence. Re-bar arrangement for a ground water tank carried out as per bar schedule and drawing.	➢ Doubly reinforced base slab ➢ Outer and inner re-bars ➢ Full length and half length re-bars for wall

Required tools/equipment: Cutter, Chisel, hammer, Crow bars, binding key. Measuring tape, marking chalk/ pencil
Safety: Use safety Boot and hand gloves.

Module Code: M 3

Module Title: Plumbing and House Wiring

Description

This module is designed to equip trainees with the knowledge and skills on household plumbing and house wiring works. The Plumbing sub module deals with installation of water supply system fittings and sanitary fixtures as well as repairing and maintenance of house water supply and sanitary fixtures. Similarly, house wiring sub module consists of wiring with smart facilities as well as repairing and replacement of damaged wiring system. Additionally, the wiring also deals with interpretation of electrical drawings of a building.

Aim

This module aims to equip trainees with knowledge and skills based on the job required to be performed by a Plumber and a House Wiring Electrician in Nepal and abroad.

Objectives

After completion of this module the trainees will be able to:

1. Carryout installation as well as repairing and maintenance of house water supply system.
2. Perform installation as well as repairing and maintenance of sanitary system.
3. Apply electrical instruments.
4. Develop the skills in performing house wiring with smart facilities.
5. Repair and replace components of damaged wiring system.

Prerequisite: Basic general module completed.

Duration: 420 hours (260 hours in house training and 160 hours OJT))

Module Structure (M 3)

S.N.	Code	Sub-modules	Nature	Total hours	Full marks
1	SM 3.1	Plumbing	T+P	130	200
2	SM 3.2	House Wiring	T+P	130	
3		On the Job Training (1 month)	P	160	100
			Total	**420**	**300**

Module Code: M 3
Sub module Code: SM 3.1
Sub module Title: Plumbing

Description
This sub module is designed to equip trainees with the knowledge and skills on household plumbing works. The plumbing sub module deals with installation repairing and maintenance of water supply system fittings and sanitary fixtures related to building and water supply scheme.

Duration: 130 hours

Competencies in plumbing

1. Develop the concept of plumbing and sanitation.
2. Identify plumbing materials/ fittings.
3. Identify/handle/operate tools and equipment.
4. Identify plumbing and sanitary symbols.
5. Cut GI pipe.
6. Thread GI pipe.
7. Join elbow/Tee/Union/cross/plug with pipe.
8. Join valves (sluice valve/gate valve/air valve/pressure relief valve/check valve/glove valve) with pipe.
9. Cut Pe pipe.
10. Make butt joint.
11. Make 90/45/bend/elbow.
12. Make Y/Tee Pe branch.
13. Make Reducer socket/Vent cowl.
14. Install sanitary fittings (bent/Tee/Y/socket) with pipe.
15. Join PVC fittings with pipe.
16. Cut CI pipe.
17. Join CI fittings with pipe.
18. Install tap (bib cock/CP tap/Mixture).
19. Install shower.
20. Install apparatus (wash basin/bath tub/ bottle trap/ shower tray/ sink/ bidet/ floor trap).
21. Install apparatus (commode/ cistern/ pan).
22. Install electrical geyser.
23. Install water pump.
24. Install roof tank.
25. Connect ferrule and service pipe line.
26. Repair tap/mixture/valves wash basin/commode/cistern/bottle trap/floor trap/pan.

Task Analysis

Task No: 1 Develop the concept of plumbing and sanitation.

Time : 2 hrs
Theory: 2 hrs
Practical: 0 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Explain historical background and development. 2. Explain water transferable dieses and Sanitation. 3. Define plumbing. 4. Keep records.	**Condition (Given):** Classroom, textbook and manuals **Task (What):** Develop the concept of Plumbing and sanitation. **Standard (How well):** Question and answer performed.	➢ Historical background and development ➢ Definition of plumbing ➢ Definition of sanitation ➢ Water transferable dieses and sanitation.

Required tools/equipment:

Safety:

Task Analysis

Task No: 2 Identify plumbing materials/ fittings.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Explain historical background and development. 2. Explain water transferable dieses and sanitation. 3. Define plumbing. 4. Keep records.	**Condition (Given):** Workshop, various plumbing materials and fittings **Task (What):** Identify plumbing materials/fitting. **Standard (How well):** All the steps followed in sequence. Oral questions asked. Test administered.	➢ Types of pipes ➢ Types of fittings. ➢ Types of valves.

Required tools/equipment:
Safety:

Task Analysis

Task No: 3 Identify//handle/operate tools and equipment.

Time : 3 hrs
Theory: 1hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Identify different tools/equipment. • Used tools • Measuring tools. • Threading tools. • Cutting tools 2. List the function of each tool 3. Keep records.	**Condition (Given):** Workshop, tools, equipment and materials **Task (What):** Identify/handle/Operate tools and equipment. **Standard (How well):** All the steps followed in sequence. Oral question asked. Test administered.	➢ Various types of tools ➢ Various types of equipment ➢ Safety of different tools

Required tools/equipment:
Safety:

Task Analysis

Task No: 4 Identify plumbing/sanitation symbols.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Prepare drawing materials. 2. Identify the symbols for real picture of object. 3. Draw the required symbols of plumbing works with plan and elevation. 4. Complete the drawing with detail information. 5. Store the drawing instruments. 6. Keep records.	**Condition (Given):** Drawing classroom and necessary drawing instruments and materials **Task (What):** Identify plumbing and sanitation symbols. **Standard (How well):** All the steps followed in sequence. Various symbols used in plumbing and sanitation identified.	➢ Definition of symbols ➢ Various plumbing and sanitary symbols

Required tools/equipment:
Safety:

Task Analysis

Task No: 5 Cut GI pipes.

Time : 2 hrs
Theory : 0.5 hr
Practical: 1.5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study drawing. 2. Collect required material. 3. Obtain required tools 4. Take measurement for cutting 5. Fix GI pipe on the pipe vice. 6. Hold the saw with blade. 7. Cut GI pipe gently with full strokes. 8. Remove pipe from the vice. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Cut GI pipe. **Standard (How well):** Work piece measured. Work piece cut. Right angle maintained.	➢ Types cutting tools ➢ Procedure ➢ Safety precaution -

Required tools/equipment: Hack saw frame/ Steel scale/Pipe vice

Safety:

- Fix the saw blade properly.
- Reduce pressure on saw just before the separation.

Task Analysis

Task No: 6 Thread GI pipe.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Clamp the GI pipe on the vice. 2. Insert the pipe die into the end of pipe. 3. Apply the little pressure to the stock. 4. Rotate die on clockwise direction. 5. Rotate die anti clockwise after completion few turn clockwise. 6. Apply lubricant on the pipe. 7. Cut thread until one or two thread out of die teeth. 8. Remove die set from pipe. 9. Clean thread. 10. Check the thread by using pipefitting. 11. Remove pipe from vice. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, fittings and materials **Task (What):** Thread GI pipe. **Standard (How well):** Length of thread maintained. Quality of thread maintained.	➢ Function of thread ➢ Thread length ➢ Lubricant use ➢ Die set and accessories ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Steel scale/Pipe vice/Stock and die/Oilcan

Safety:

- **Fix** the saw blade properly
- DO NOT spoil oil on the floor.
- DO NOT clean thread by necked hand.

Task Analysis

Task No: 7 Join elbow/Tee/union/cross/cap with pipe.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study drawing. 2. Obtain required materials. 3. Obtain required Tools. 4. Make the thread on GI pipe. 5. Rap hemp clockwise on the thread. 6. Turn GI fitting freely two or three thread. 7. Tighten fitting (elbow/tee/union/cross/cap) full thread by pipe wrench. 8. Clean hemp of out side fitting. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, fittings and materials **Task (What):** Joint fitting with GI pipe. **Standard (How well):** Thread length Center to center measured. Tightness of Fitting maintained. Leakage tested.	➢ Z dimension calculation ➢ Center to center dimension ➢ Tightness of fitting ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Steel scale/Pipe vice/stock and die/pipe wrench/oilcan

Safety:

- **DO** NOT damage fitting surface by wrench.
- DO NOT use pipe wrench for hammer.

Task Analysis

Task No: 8 Join valves with GI pipe.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study drawing. 2. Obtain required materials. 3. Obtain required Tools. 4. Make the thread on GI pipe. 5. Rap hemp clockwise on the thread. 6. Turn Gate valve freely two or three thread. 7. Tighten Gate valve. 8. Tighten full thread by Adjustable wrench. 9. Clean hemp of out side valve. 10. Test the leakage. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, fittings and materials **Task (What):** Join valve with GI pipe. **Standard (How well):** Gate valve turned Gate valve tightened. Leakage tested.	➢ Different valve ➢ Tightness of valve ➢ Flow of water on valve ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Steel scale/Pipe vice/stock and die/pipe Adjustable wrench/oilcan

Safety: DO NOT damage Valve surface.

Task Analysis

Task No: 9 Cut Pe pipe.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study drawing. 2. Collect required material. 3. Obtain required tools 4. Take measurement for cutting 5. Fix Pe pipe on the pipe vice. 6. Hold the wooden saw. 7. Cut Pe pipe gently with full strokes. 8. Remove pipe from the vice. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Cut Pe pipe. **Standard (How well):** Work piece cut. Work piece measured. Right angle maintained.	➢ Introduction to Pe pipe ➢ Properties of Polyethylene materials ➢ Types of Pe pipe ➢ Cutting devices ➢ Procedure ➢ Safety precaution

Required tools/equipment: Measuring tape/Wooden saw/Pipe vice
Safety: Be careful while use wooden saw.

Task Analysis

Task No: 10 Make butt joint of Pe pipe.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study the drawing. 2. Obtain the required tools and equipments. 3. Obtain the required materials. 4. Select the correct size of pipe according to drawing. 5. Measure and mark the necessary dimension by yellow pencil. 6. Cut the pipe straightly by wooden saw. 7. Clean the cut surface. 8. Heat Pe pipe on the hot plat. 9. Join the two pieces of Pe pipe immediately with required pressure on straightly. 10. Check the butt-welding use by hammer/cut/water. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Make butt joint of Pe pipe. **Standard (How well):** Measurement checked. Straight welded. Leakage tested.	➢ Function of heating plate ➢ Method of joining ➢ Theory of Teflon tape/marker ➢ Size of heating plate ➢ Welding temperature ➢ Procedure ➢ Safety precaution

Required tools/equipment: Wooden saw / Steel scale/Pipe vice/Pe file/Hot plate/Knife

Safety:

- **DO** NOT ply with hot welding plate.
- Be careful while use wooden saw.

Task Analysis

Task No: 11 Make 90/45-bend/ elbow.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study the drawing. 2. Obtain the required tools and equipments. 3. Obtain the required materials. 4. Select the correct size of pipe according to drawing. 5. Calculate cutting angle. 6. Mark the necessary dimension by yellow pencil. 7. Cut the pipe necessary angle/straight by wooden saw. 8. Clean the cut surface. 9. Join the no. Of pieces of Pe pipe as per cutting pieces. 10. Check the angle of bend 90/45 by protector. 11. Check water test. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Make Pe bend/elbow. **Standard (How well):** Measurement checked. Straight welded. Angle cut. Right angle checked. Leakage tested.	➢ Calculation of cutting angle ➢ Method of angle cutting ➢ Angle cutting devices ➢ Procedure ➢ Safety precaution

Required tools/equipment: Wooden saw / Steel scale/Pe file/Hot plate/Knife/Meter box.

Safety:

- DO NOT ply with hot welding plate...
- Be careful while use wooden saw.
- DO NOT pour oil on welding surface.

Task Analysis

Task No: 12 Make Tee/Y Pe branch.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study the drawing. 2. Obtain the required tools and equipments. 3. Obtain the required materials. 4. Select the correct size of pipe according to drawing. 5. Calculate cutting angle. 6. Mark the necessary dimension by yellow pencil. 7. Cut the pipe necessary angle/straight by wooden saw. 8. Clean the cut surface. 9. Join the two pieces of Pe pipe as per cutting pieces. 10. Cut the pipe necessary angle by wooden saw. 11. Join the two set of Pe pipe as per cutting pieces. 12. Check the angle of branch 90/45 by protector. 13. Check water test. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 16. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Make Tee/Y Pe branch. **Standard (How well):** Measurement checked. Straight welded. Angle cut. Right angle checked. Leakage tested.	➢ Calculation of cutting angle ➢ Method of angle cutting ➢ Procedure ➢ Safety precaution ➢ Angle cutting devices

Required tools/equipment: Wooden saw / Steel scale/Pe file/Hot plate/Knife/Meter box.

Safety:

- Be careful while use wooden saw.
- DO NOT pour oil on welding surface.

Task Analysis

Task No: 13 Make reducer socket/vent cowl.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study the drawing. 2. Obtain the required tools and materials. 3. Select the correct size of pipe according to drawing. 4. Select the correct size of pipe. 5. Mark on the pipe according to drawing. 6. Head the pipe end by blowlamp up to required measurement. 7. Expand the heated pipe use of taper wooden block. 8. Join expanded pipe with other pipe. 9. Check the reducer socket according to drawing. 10. Test water. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, materials and drawing **Task (What):** Make Pe reducer socket. **Standard (How well):** Measurement checked. Straight welded. Right angle checked. Leakage tested.	➢ Calculation of cutting angle ➢ Method of angle cutting ➢ Procedure ➢ Safety precaution ➢ Angle cutting devices

Required tools/equipment: Wooden saw / Steel scale/Pe file/Hot plate/Knife/Meter box.
Safety:

- Be careful while use blower.
- DO NOT pour oil on welding surface.

Task Analysis

Task No: 14 Install sanitary fitting (Bend/Tee/Y/Socket) with Pipe.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Trace drawing. 2. Prepare materials list. 3. Prepare materials. 4. Prepare tools. 5. Cut necessary Pe pipe as per calculation. 6. Assemble different fitting with Pe pipe as per drawing. 7. Perform leakage test. 8. Dismantle pipeline. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, fittings, materials and drawing **Task (What):** Install sanitary fitting (Bend/Tee/Y/Socket) with Pipe. **Standard (How well):** Alignment of pipeline aligned. Leakage tested. Measurement checked. Straight welded. Level checked.	➢ Calculation of cutting angle ➢ Calculate cutting length of PVC pipe ➢ Procedure ➢ Safety precaution

Required Tools/equipment: Wooden saw / Steel scale/Pe file/Hot plate/Knife/Meter box

Safety:

- Be careful while use wooden saw.
- DO NOT pour oil on welding surface.

Task Analysis

Task No: 15 Join PVC fitting with pipe.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Read drawing. 2. Obtain required materials and tool, 3. Cut necessary PVC pipe as per calculation. 4. Clean joint surface of PVC pipe by grindings paper. 5. Use lubricant joint surface of PVC pipe by brush. 6. Assemble different fitting with PVC pipe as per drawing. 7. Perform leakage test. 8. Dismantle pipeline. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment, fittings, materials and drawing **Task (What):** Join PVC fitting with pipe. **Standard (How well):** Alignment of pipeline aligned. Leakage tested. Measurement checked Level checked.	➢ Identification of jointing materials ➢ Calculate cutting length of PVC pipe ➢ Procedure ➢ Safety precaution

Required tools/equipment: Wooden saw / Measuring tape/Wooden file/Knife/Meter box.

Safety:

- **Be** careful while use wooden saw.
- Handle carefully with solvent cement because it is harmful/highly burnable.

Task Analysis

Task No: 16 Cut CI pipe.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Read drawing. 2. Prepare materials and tools. 3. Mark circle on the CI pipe use by chalk. 4. Pipe put on the sand floor. 5. Cut CI pipe help with cold chisel and hammer. 6. Clean all tools & equipment & put at proper place 7. Clean working place. 8. Keep records.	**Condition (Given):** Workshop, necessary tools, equipment and materials **Task (What):** Cut CI pipe. **Standard (How well):** Smooth chiseled. Straight cut. Correct measured.	➢ Introduction to CI pipe ➢ Properties of cast iron materials ➢ Types of CI pipe ➢ Size of CI pipe ➢ Cutting tools and equipment ➢ Procedure ➢ Safety precaution

Required tools/equipment: - Measuring tape/hammer/Cold chisel

Safety:

- DO NOT use mushroom head chisel
- Wear glove while cutting

Task Analysis

Time : 5 hrs
Theory: 2 hr
Practical: 3 hrs

Task No: 17 Join CI fittings with pipe.

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Read drawing. 2. Obtain required materials and tool, 3. Cut necessary CI pipe as per calculation. 4. Melt the lead. 5. Fix spigot to Hub of CI pipe. 6. Yarn hemp between spigot and hub of pipe 7. Put mud around the hub. 8. Pour the melting lead on the hub. 9. Clack lead with clacking tools. 10. Assemble different fitting with CI pipe as per drawing. 11. Perform leakage test. 12. Dismantle pipeline. 13. Clean all tools & equipment & put at proper place 14. Clean working place. 15. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Join CI fitting with pipe. **Standard (How well):** Alignment of pipeline aligned. Leakage tested. Measurement checked Level checked. Tightness of yarning of hemp maintained. Tightness of calking lead maintained.	➢ Temperature of melt lead ➢ Tools ➢ Types of joints ➢ Hemp ➢ Quantity and area of pouring lead ➢ Identification of jointing materials ➢ Calculate cutting length of CI pipe ➢ Procedure ➢ Safety precaution

Required tools/equipment: -Measuring tape/hammer/Cold chisel/Yarning tool/Calking tool/Rope/Stove/Pan/

Safety:

- DO NOT pour water on melting lead.
- Remove slag before pour lead.

Task Analysis

Task No: 18 Install tap (Bib cock/CP tap/Mixture).

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study drawing. 2. Obtain required materials. 3. Obtain required Tools. 4. Make the thread on GI pipe. 5. Rap hemp clockwise on the thread. 6. Turn GI socket freely two or three thread. 7. Tighten GI socket full thread by pipe wrench. 8. Fix pipeline on the wall. 9. Rap ceiling tape on the tap thread. 10. Tighten tap on the socket. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Install Tap (Bib cock/CP tap/Mixture**).** **Standard (How well):** Leakage proof tested. Straightness of tap maintained.	➢ Types of taps ➢ Tightness of tap ➢ Flow water on tap ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Measuring tape/Pipe vice/stock and die/pipe Adjustable wrench/oilcan

Safety: DO NOT damage Tap surface by wrench.

.

Task Analysis

Task No: 19 Install shower.

Time : 6 hrs
Theory: 1 hr
Practical: 5 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Study drawing. 2. Obtain required materials 3. Obtain required Tools. 4. Layout on the wall. 5. Install water pipeline hot and cold 6. Install conceal valve 7. Insulate hot water pipeline. 8. Install shower. 9. Perform leakage test. 10. Clean working area. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Install shower. **Standard (How well):** Height of shower maintained as per drawing. Height of conceal valve maintained. Leakage tested Level checked.	➢ Height of conceal valve ➢ Types of shower ➢ Stander height of shower ➢ Size of drain pipe ➢ Unit calculation ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Measuring tape/Pipe vice/stock and die/pipe Adjustable wrench/oilcan
Safety: DO NOT damage cancel valve surface by wrench

Task Analysis

Task No: 20 Install apparatus (Washbasin/Bath tub/ Bottle trap/Sink).

Time : 14 hrs
Theory: 2 hr
Practical: 12 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Read drawing. 2. Obtain required materials and tools. 3. Mark on the wall for fix bracket as per drawing. 4. Make the hole for fixing bracket by hand drill machine. 5. Fix the bracket with grip and screw. 6. Install apparatus (basin/sink/urinal) on the bracket. 7. Apple white cement between apparatus and wall. 8. Fix waste coupling. 9. Install bottle trap. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Install apparatus **Standard (How well):** Stander height of apparatus maintained. Leakage tested. Level checked Correct positioned Meter level marked.	➢ Height of apparatus as per drawing ➢ Select of apparatus ➢ Height of drain point ➢ Height of water source ➢ Select bracket ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oilcan/Hand drill machine/Hammer
Safety: Handle drill machine appropriately.

Task Analysis

Task No: 21 Install apparatus (Commode/Cistern/Pan).

Time : 10 hrs
Theory: 2 hr
Practical: 8 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Read drawing. 2. Obtain required materials and tools. 3. Connect drain pipeline with siphon. 4. Rest apparatus (Pan/Commode) 5. Make a level of apparatus. 6. Press oakum between apparatus and siphon or pipe. 7. Put cement on the oakum. 8. Fix the cistern. 9. Connect flush pipe with cistern and pan/ commode. 10. Connect water pipeline with angle valve 11. Test water leakage. 12. Clean all tools & equipment & put at proper place 13. Clean working place. 14. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Install apparatus (Commode/Cistern/Pan**).** **Standard (How well):** Stander height of apparatus maintained. Leakage tested. Level checked Correct positioned Meter level marked.	➢ Height of apparatus as per drawing ➢ Select of apparatus ➢ Height of drain point ➢ Height of water source ➢ Height of waste water source ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Measuring tape//Pipe wrench/ Adjustable wrench/ Hand drill machine/Hammer
Safety: Take precaution of electricity**.**

Task Analysis

Task No: 22 Install electrical geyser (project work).

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Read drawing. 2. Obtain required materials and tools. 3. Mark on the wall for fix bracket as per drawing. 4. Make the hole for fixing bracket by hand drill machine. 5. Fix the bracket with grip and screw. 6. Install Electrical Geyser on the bracket. 7. Connect hot and cold water pipe line with necessary valve and fitting. 8. Check water leakage. 9. Connect electric line. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Install electrical geyser. **Standard (How well):** Electrical Geyser installed as per drawing. Leakage tested Level checked Correct positioned	➢ Stander height of Electrical Geyser installed ➢ Height of water source ➢ Selection of bracket ➢ Electricity ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oilcan/Hand drill machine/Hammer

Safety:

- Handle drill machine appropriately.
- Take precaution of electricity.

Task Analysis

Task No: 23 Install water pump.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Read drawing. 2. Obtain required materials and tools. 3. Mark on the wall for fix bracket as per drawing. 4. Measure horizontal level of hole (for foundation) 5. Fix pump according to measurement. 6. Install foot valve or check valve on the end of suction pipeline. 7. Install the suction pipeline with pump. 8. Install Delivery pipeline with necessary fitting. 9. Check the connection and leakage of joint. 10. Test and run the pump with water suction. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Install water pump. **Standard (How well):** Dimension maintained. Pump fixed on the floor. Leakage tested Level maintained.	➢ Types of domestic pumps and their uses ➢ Function of water pumps ➢ Procedure ➢ Safety precaution ➢

Required tools/equipment: Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oilcan/Hand drill machine/Hammer

Safety:

- Handle drill machine appropriately.
- Take precaution of electricity.
- DO NOT run pump without water.

Task Analysis

Task No: 24 Install roof tank (project work).

Time : 9 hrs
Theory: 1 hr
Practical: 8 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Read drawing. 2. Obtain required materials and tools. 3. Calculate inlet outlet and overflow pipe. 4. Cut outlet pipe according to given drawing. 5. Make the hole by drill machine for inlet/outlet/overflow. 6. Tighten Tank nut with hexagon nut for inlet/outlet and overflow. 7. Put tank on the tank stand. 8. Install necessary fitting (gate valve, union, elbow and tee etc.) 9. Check the connection water leakage. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Install roof tank. **Standard (How well):** Level checked Leakage checked. Water tank installed as per drawing.	➢ Calculate tank size ➢ Area selection ➢ Installation height of tank ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oilcan/Hand drill machine/Hammer

Safety:

- Handle drill machine appropriately.
- DO NOT stay long time inside the tank along.

Task Analysis

Task No: 25 Connect ferrule and service pipe.

Time : 3 hrs
Theory: 1 hr
Practical: 2 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Obtain required materials and tools. 2. Fix the sadded clamp on the main pipe line. 3. Make a hole by use of drill machine. 4. Tap on the hole as per required size. 5. Fix the ferrule cock on the main pipe line. 6. Connect the pipe and pipe fitting for service pipe. 7. Check water leakage. 8. Store all tools and materials. 9. Clean all tools & equipment & put at proper place 10. Clean working place. 11. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Connect ferrule and service pipe. **Standard (How well):** Leakage checked. Straightness of tap maintained.	➢ Types of ferrule cock ➢ Tightness of ferrule ➢ Flow water on ferrule ➢ Procedure ➢ Safety precaution

Required tools/equipment: Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oilcan/Hand drill machine/Hammer/Tap.

Safety:

Task Analysis

Task No: 26 Repair taps (tap/mixture)/valve/apparatus.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objective	Related Technical Knowledge
1. Find out the fault. 2. Prepare repairing tools and materials. 3. Close main water pipeline valve. 4. Open repairable tap/apparatus and find out the major problem. 5. Replace new parts. 6. Install repair tap/ apparatus. 7. Check water leakage. 8. Clean all tools & equipment & put at proper place 9. Clean working place. 10. Keep records.	**Condition (Given):** Site/workshop, necessary tools, equipment, fittings, apparatus materials and drawing **Task (What):** Repair tap(Tap/mixture) /valve/apparatus. **Standard (How well):** Leakage checked. Level checked. Tap repaired Apparatus repaired	➢ Purpose of repair ➢ Types of repair ➢ Periodical maintenance ➢ Procedure ➢ Safety precaution

Required tools/equipment: Tool set
Safety: Do not open and tap/apparatus without close valve.

Module Code: M 3
Sub module Code: SM 3.2
Sub module Title: House Wiring

Description
This sub module is designed to equip trainees with the knowledge and skills on house wiring systems and works. The house wiring sub module focuses to provide skills on performing wiring in a house with smart facilities as well as repairing and replacement of damaged wiring system. Besides, the wiring also deals with interpretation of electrical drawings of a building.

Duration: 130 hours

Competencies in House Wiring

1. Develop the concept of electricity.
2. State ohm's law.
3. Calculate current/voltage/resistance.
4. Measure resistance applying Ohmmeter.
5. Measure voltage applying Voltmeters.
6. Measure current applying Ampere meter.
7. Measure electrical powers.
8. Calculate total loads.
9. Identify electrical symbols and codes.
10. Interpret electrical drawings.
11. Install/control one lamp by one way switches.
12. Install/control number of lamps together by one way switch in parallel circuit.
13. Install/control a lamp from two different places using 2-two-way switches.
14. Install/control a lamp from three or more different places using 2 two-way and one intermediate switch.
15. Install/control two lamps from 4 different places 2 two-way and 2 intermediate switches.
16. Install/control an electric bell with 4 way indicators using 4 push switches of 4 different places.
17. Install/control one lamp, one three-pin socket with 2 switches for ON and OFF individual point.
18. Install outdoor lighting in garden/ trees/' shrubs/ flowers/ decks/ walkways and existing (project work).
19. Repair / replace main circuit / branch- circuit's junction boxes of wiring system.
20. Repair / replace lighting systems of wiring.
21. Repair / replace switches of wiring system.
22. Repair / replace socket outlets / plugs of the wiring system.
23. Perform troubleshooting of the lamps/tubes/doorbells.
24. Repair / replace ceiling rose.
25. Repair / replace protective devices.
26. Install / connect earthing electrode.
27. Lay PVC pipe for conceal wiring.
28. Draw wire/cable through PVC pipe applying fish wire.
29. Install/ connect accessories/fittings/protective devices/ distribution board.
30. Install wiring system in a house with smart facilities (project work).

Task Analysis

Task No: 1 Develop the concept of electricity.

Time : 2 hrs
Theory: hrs
Practical: 2 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Define electricity. 2 Describe history of electricity 3 Enlist importance of electricity. 4 Enlist types of electricity. 5 Enlist uses of electricity. 6 Enlist sources of electricity. 7 Keep records.	**Condition (Given):** Classroom, textbook and manual **Task (What):** Develop the concept of electricity **Standards (How well):** Electricity defined. History of electricity described. Importance of electricity enlisted.	➢ Definition of electricity ➢ History of electricity ➢ Importance ➢ Types of electricity ➢ Uses of electricity ➢ Sources of electricity

Tools/equipment:
Safety:

Task Analysis

Task No: 2 State Ohm's law.

Time : 2 hrs
Theory: 2 hrs
Practical: hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Read electrical definition. 2 Describe the relationship among current, voltage and resistance. 3 Apply current dividing rule. 4 Apply voltage dividing rule. 5 Keep records.	**Condition (Given):** Class room, textbook and manual **Task (What):** State ohm's law. **Standards (How well):** Ohm's law stated. Relationship among current, voltage and resistance described.	➢ Ohm's Law ➢ Importance ➢ Application ➢ Units of measurement ➢ Relationship with V, I & R ➢ Current rule ➢ Voltage rule

Tools/equipment:
Safety:

Task Analysis

Task No: 3Calculate current/voltage/resistance.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive problem. 2 Recall ohm's law. 3 Calculate current. 4 Calculate voltage. 5 Calculate resistance. 6 Keep records.	**Condition (Given):** Classroom, textbook, manual and calculator **Task (What):** Calculate current/ voltage/ resistance. **Standards (How well):** Current calculated. Voltage calculated. Resistance calculated.	➢ Units of current ➢ Units of voltage ➢ Units of resistance ➢ Calculation procedure ➢ Types of circuit (closed, opened & short)

Tools/equipment: Calculator.
Safety: Safe use of calculator.

Task Analysis

Task No: 4 Measure resistances applying Ohmmeter.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools equipment & materials. 3 Construct circuit for measuring resistance using Ohm meter. 4 Operate Ohm meter. 5 Test and record measured resistance. 6 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments and required materials **Task (What):** Measure resistances applying Ohmmeter. **Standards (How well):** Resistance measured applying Ohmmeter.	➢ Principle of Ohm meter ➢ Connection diagram of Ohm meter ➢ Application ➢ Connecting procedures in circuit ➢ Safety precaution

Tools/equipment: Connecting leads, Ohmmeter/ multi-meter
Safety: Safe handling of electrical measuring instrument

Task Analysis

Task No: 5 Measure voltages applying Voltmeters.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools equipment & materials. 3 Construct circuit for measuring voltage using Volt meter. 4 Operate Volt meter. 5 Measured voltage using Volt meter. 6 Test and record measured voltage. 7 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments and required materials **Task (What):** Measure voltages applying Voltmeters**.** **Standards (How well):** Voltages measured applying Volt meter.	➢ Principle of Volt meter ➢ Connection diagram of Voltmeter ➢ Application ➢ Connecting procedures in circuit ➢ Safety precaution

Tools/equipment: Connecting leads, Volt meter
Safety: Safe handling of voltmeter, correct connecting technique of voltmeter

Task Analysis

Task No: 6 Measure current applying Ampere meter.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools equipment & materials. 3 Construct circuit for measuring current using Ampere meter. 4 Operate Ampere meter. 5 Measure current using Ampere meter. 6 Test and record measured current. 7 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments and required materials **Task (What):** Measure current applying Ampere meter. **Standards (How well):** Current measured applying Ampere meter.	➢ Principle of Ampere meter ➢ Connection diagram of Ammeter ➢ Connecting procedures in circuit ➢ Application ➢ Procedure. ➢ Safety precaution.

Tools/equipment: Connecting leads, ammeter
Safety: Safe handling of ammeter, correct connecting technique of ammeter

Task Analysis

Task No: 7 Measure electrical powers.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Recall electrical power structure. 2 Collect necessary tools equipment & materials. 3 Construct circuit for measuring current / voltage. 4 Construct circuit for measuring power. 5 Compare measured power. 6 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments and required materials **Task (What):** Measure electrical powers. **Standards (How well):** Electrical power measured.	➢ Definition of work, power and energy, ➢ Units of work, power & energy ➢ Measuring procedure ➢ Conversion of power ➢ Procedure ➢ Safety precaution.

Tools/equipment: Connecting leads, power meter.
Safety: Safe handling of watt meter, correct connecting technique of watt meter.

Task Analysis

Task No: 8 Calculate total loads.

Time : 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools equipment & materials. 3 Prepare for measuring load. 4 Measure load. 5 Test and record load. 6 Keep records.	**Condition (Given):** Workshop, necessary tools, instrument materials **Task (What):** Calculate total load. **Standards (How well):** Total load calculated. Individual and group loads compared.	➢ Concept of total load ➢ Procedure. ➢ Safety precaution

Tools/equipments:
Safety:

Task Analysis

Task No: 9 Identify/draw electrical symbols and codes.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Prepare for electrical symbols drawing. 4 Draw electrical symbols. 5 Keep records.	**Condition (Given):** Classroom/drawing room with drawing instruments and manual. **Task (What):** Identify/draw electrical symbols and codes. **Standards (How well):** Electrical symbols identified. Electrical symbols drawn. Electrical codes identified.	➢ **Electrical symbols** ▪ Definition ▪ Importance ▪ Use ▪ Size ➢ **Electrical codes** ▪ Definition ▪ Importance ▪ Use ▪ Size ▪ Number

Tools/equipment: Electrical codes of practice, NEA rules and regulations, Electrical specifications, drawing instrument set, drawing board, cello tape.
Safety: Safe handling of instruments.

Task Analysis

Task No: 10 Interpret electrical drawings.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions 2 Obtain electrical drawing 3 Collect measuring instruments & materials. 4 Identify location of accessories and fittings. 5 Ensure cable route. 6 Keep records.	**Condition (Given):** Classroom/workshop and electrical drawings **Task (What):** Interpret electrical drawings. **Standards (How well):** Electrical drawings interpreted. Location of accessories and fittings identified.	➢ Symbols of accessories and fittings ➢ Identification of current capacity of accessories, fittings and protective devices ➢ Interpretation technique of drawing ➢ Safety precautions

Tools/equipment: Electrical codes of practice, NEA rules and regulations, Electrical specifications, drawing instrument set, drawing board, cello tape.
Safety: Safe handling of instruments.

Task Analysis

Task No: 11 Install / control one lamp by one way switches.

Time : 6 hrs
Theory: 3 hr
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Prepare for electrical installation. 4 Prepare layout on the drawing board for installation. 5 Install mounting boxes. 6 Install wooden listics/ batten / PVC casing - capping / conduit. 7 Lay wires / cables. 8 Install protective devices. 9 Install control devices. 10 Install lighting fixtures. 11 Connect wire in lighting fixture. 12 Connect wire in protective devices. 13 Connect wire in controlling devices. 14 Connect wire in junction boxes. 15 Inspect and check wiring. 16 Test wiring. 17 Clean all tools & equipment & put at proper place 18 Clean working place. 19 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments, drawing and required materials **Task (What):** Install / control one lamp by one way switches. **Standards (How well):** Protective devices installed. Control deices installed. Fixtures installed. Junction boxes installed. Correct sized wires / cables laid. All devices, fixtures and wires connected. Entire circuit tested. Operation checked.	➢ Electrical Circuits (Series and Parallel concept only) ➢ Diagrams (Layout & Wiring concept only **)** ➢ **Protective devices** ⊠ Definition ⊠ Importance ⊠ Functions ⊠ Types ⊠ Current capacities ➢ **Controlling devices** ⊠ Definition ⊠ Importance ⊠ Functions ⊠ Types ⊠ Current capacities ➢ **Fixtures / fittings** ⊠ Definition ⊠ Importance ⊠ Functions ⊠ Types ⊠ Sizes ➢ **Accessories** ⊠ Definition ⊠ Importance ⊠ Functions ⊠ Types ⊠ Capacities ➢ **Wires and conductors** ⊠ Definition ⊠ Importance ⊠ Types ⊠ Current carrying capacities ➢ Procedure

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware and wiring materials.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 12 Install / control number of lamps together by one way by one way switches in parallel circuit.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Prepare for electrical installation 4 Prepare layout on the drawing board for installation. 5 Install mounting boxes. 6 Install wooden listiscs/ batten / PVC casing - capping / conduit 7 Lay wires / cables. 8 Install protective devices. 9 Install control devices. 10 Install lighting fixtures. 11 Connect wire in lighting fixture. 12 Connect wire in protective devices. 13 Connect wire in controlling devices. 14 Connect wire in junction boxes. 15 Inspect and check wiring. 16 Test wiring. 17 Clean all tools & equipment & put at proper place 18 Clean working place. 19 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments, drawing and required materials . **Task (What):** Install / control number of lamps together by one way by one way switches in parallel circuit**.** **Standards (How well):** Protective devices installed. Control deices installed. Fixtures installed. Junction boxes installed. Correct sized wires / cables lay. All devices, fixtures and wires connected. Entire circuit tested. Operation checked.	➢ Selection of wire sizes ➢ Selection of controlling devices ➢ Selection of protective devices ➢ Procedure ➢ Safety precaution.

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hard-wares and wiring materials.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 13 Install / control a lamp from two different places using 2-two way switches.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Prepare for electrical installation. 4 Prepare layout on the drawing board for installation. 5 Install mounting boxes. 6 Install wooden listics/ batten / PVC casing - capping / conduit. 7 Lay wires / cables. 8 Install protective devices. 9 Install control devices. 10 Install lighting fixtures. 11 Connect wire in lighting fixture. 12 Connect wire in protective devices. 13 Connect wire in controlling devices. 14 Connect wire in junction boxes. 15 Inspect and check wiring. 16 Test wiring. 17 Clean all tools & equipment & put at proper place 18 Clean working place. 19 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments, drawing and required materials **Task (What):** Install / control a lamp from two different places using 2-two way switches. **Standards (How well):** Protective devices installed. Control deices installed. Fixtures installed. Junction boxes installed. Correct sized wires / cables laid. All devices, fixtures and wires connected. Entire circuit tested. Operation checked.	➢ Selection of wire sizes ➢ Selection of controlling devices ➢ Selection of protective devices ➢ Procedure ➢ Safety precaution

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hard-wares and wiring materials.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 14 Install / control a lamp from three or more different places using 2-two way and one intermediate switch.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Prepare for electrical installation. 4 Prepare layout on the drawing board for installation. 5 Install mounting boxes. 6 Install wooden listics/ batten / PVC casing - capping / conduit. 7 Install mounting boxes. 8 Lay wires / cables. 9 Install protective devices. 10 Install control devices. 11 Install lighting fixtures. 12 Connect wire in lighting fixture. 13 Connect wire in protective devices. 14 Connect wire in controlling devices. 15 Connect wire in junction boxes. 16 Inspect and check wiring. 17 Test wiring. 18 Clean all tools & equipment & put at proper place 19 Clean working place. 20 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments, drawing and required materials **Task (What):** Install / control a lamp from three or more different places using 2-two way and one intermediate switch. **Standards (How well):** Protective devices installed. Control deices installed. Fixtures installed. Junction boxes installed. Correct sized wires / cables lay. All devices, fixtures and wires connected. Entire circuit tested. Operation checked.	➢ Selection of wire sizes ➢ Selection of controlling devices ➢ Selection of protective devices ➢ Procedure ➢ Safety precaution.

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware and wiring materials.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 15 Install / control two lamps from four different places using 2-two and two way intermediate switches.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Prepare for electrical installation. 4 Prepare layout on the drawing board for installation. 5 Install mounting boxes. 6 Install wooden listics/ batten / PVC casing - capping / conduit. 7 Lay wires / cables. 8 Install protective devices. 9 Install control devices. 10 Install lighting fixtures. 11 Connect wire in lighting fixture. 12 Connect wire in protective devices. 13 Connect wire in controlling devices. 14 Connect wire in junction boxes. 15 Inspect and check wiring. 16 Test wiring. 17 Clean all tools & equipment & put at proper place 18 Clean working place. 19 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments, drawing and required materials **Task (What):** Install / control two lamps from four different places using 2-two and two way intermediate switches. **Standards (How well):** Protective devices installed. Control deices installed. Fixtures installed. Junction boxes installed. Correct sized wires / cables laid. All devices, fixtures and wires connected. Entire circuit tested. Operation checked.	➢ Selection of wire sizes ➢ Selection of controlling devices ➢ Selection of protective devices ➢ Procedure ➢ Safety precaution.

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware and wiring materials.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 16 Install / control an electric bell with four way indicators using four push switches of 4 different places.

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools, equipment & materials 3 Prepare for electrical installation. 4 Prepare layout on the drawing .board for installation. 5 Install wooden listics/ batten / PVC casing - capping / conduit. 6 Install mounting boxes. 7 Lay wires / cables. 8 Install protective devices. 9 Install push bell switch. 10 Install indicators. 11 Connect wire in protective devices. 12 Connect wire in controlling (push bell) devices. 13 Connect wire in indicators. 14 Inspect and check wiring. 15 Test wiring. 16 Clean all tools & equipment & put at proper place 17 Clean working place. 18 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments, drawing and required materials **Task (What):** Install / control an electric bell with four way indicators using four push switches of 4 different places. **Standards (How well):** Protective devices installed. Control deices installed. Fixtures installed. Junction boxes installed. Correct sized wires / cables lay. All devices, fixtures, and wires connected. Entire circuit tested. Operation checked.	➢ Selection of wire sizes ➢ Selection of controlling devices ➢ Selection of protective devices ➢ Procedure ➢ Safety precaution

Tools/equipment: Set of wiring tool kit, control and indicating accessories, lighting fittings, fixing hard wares and wiring materials.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Time : 4 hrs
Theory: 1 hr
Practical: 3 hrs

Task No: 17 Install / control one lamp, one three pin socket with 2 switches for ON and OFF individual point.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Prepare for electrical installation. 4 Prepare layout on the drawing board for installation. 5 Install wooden listics/ batten / PVC casing - capping / conduit. 6 Install mounting boxes. 7 Lay wires / cables. 8 Install protective devices. 9 Install control device. 10 Install socket outlets. 11 Install lighting fixtures. 12 Connect wire in lighting fixture. 13 Connect wire in protective devices. 14 Connect wire in controlling devices. 15 Connect socket outlets. 16 Connect wire in junction boxes. 17 Inspect and check wiring. 18 Test wiring. 19 Clean all tools & equipment & put at proper place 20 Clean working place. 21 Keep records.	**Condition (Given):** Workshop, necessary electrical tools, instruments, drawing and required materials **Task (What):** Install / control one lamp, one three pin socket with 2 switches for ON and OFF individual point. **Standards (How well):** Protective devices installed. Control deices installed. Fixtures installed. Junction boxes installed. Correct sized wires / cables lay. All devices, fixtures and wires connected. Entire circuit tested. Operation checked.	➢ Selection of wire sizes ➢ Selection of controlling devices ➢ Selection of protective devices ➢ Procedure ➢ Safety precaution

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hard wares and wiring cables and materials, and Power sockets

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 18 Install outdoor lighting in garden / tree / shrubs / followers / decks / walkways and existing buildings (Project Work).

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Mark the location of fixtures in the promises. 4 Mark the location of socket outlets in the promises. 5 Mark the location of switches in the promises. 6 Dig the trenches. 7 Lay out the materials along the trenches. 8 Assemble the conduits. 9 Prepare for pulling wires through the conduit. 10 Install mounting boxes 11 Lay wires / cables. 12 Install protective devices. 13 Install control devices. 14 Install socket outlets. 15 Install lighting fixtures. 16 Connect wire in lighting fixture. 17 Connect wire in protective devices. 18 Connect wire in controlling devices. 19 Connect socket outlets. 20 Connect wire in junction boxes. 21 Inspect and check wiring. 22 Connect power. 23 Test wiring. 24 Back fill the trenches. 25 Clean all tools & equipment & put at proper place 26 Clean working place. 27 Keep records.	**Condition (Given):** Site/ workshop, necessary electrical tools, instruments, drawing and required materials **Task (What):** Install outdoor lighting in garden / tree / shrubs / followers / decks / walkways and existing buildings (Project Work). **Standards (How well):** Out door lighting in garden / tree / shrubs / followers / decks / walkways and existing buildings installed.	➢ Selection of wire sizes ➢ Selection of controlling devices ➢ Selection of protective devices ➢ Out door lighting design and drawing ➢ Procedure ➢ Safety precaution

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hard wares and wiring cables and materials, and Power sockets.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 19 Repair / replace main circuit / branch- circuits junction boxes of wiring system.

Time : 5 hrs
Theory: 2 hrs
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually main and branch circuits junction boxes of wiring system. 4. Check connection points for malfunction. 5. Identify faults. 6. Repair and maintain the faults. 7. Test circuits. 8. Pre-commission the circuit. 9. Operate the circuit. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Repairable existing wiring, necessary electrical tools, instruments and required materials **Task (What):** Repair / replace main circuit / branch- circuit's junction boxes of wiring system. **Standards (How well):** Main circuit / branch-circuit's junction boxes of wiring system repaired and replaced.	➢ Functions of ⍁ Open circuit ⍁ Close circuit ➢ Cause and effects of ⍁ Short circuit ⍁ Leakage ⍁ Earth fault ➢ Number of wire permitted in the junction box ➢ Wire sizes, capacity and uses ➢ Types of wire / cables ➢ Procedure ➢ Safety precaution

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware and wiring cables and materials, and fixing boxes.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 20 Repair / replace lighting systems of wiring.

Time : 3 hrs
Theory: hrs
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually individual lighting circuits of wiring system. 4. Check lighting circuits run through the house or system. 5. Check radio, television telephone circuits. 6. Identify problems. 7. Repair and maintain the faults. 8. Test circuits. 9. Pre-commission the circuit. 10. Operate the circuit. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Repairable existing wiring, necessary electrical tools, instruments and required materials **Task (What):** Repair / replace lighting systems of wiring. **Standards (How well):** Lighting systems of wiring repaired and replaced.	➢ Procedure ➢ Safety precautions

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hard-wares and wiring cables and materials, fixing boxes test lamp/phase tester.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 21 Repair / replace socket outlets / plugs of the wiring systems.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually socket outlet points and circuits of wiring system. 4. Check connection points for malfunction. 5. Identify problems. 6. Repair and maintain the faults. 7. Test circuits. 8. Pre-commission the circuit. 9. Operate the circuit. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Repairable existing wiring, necessary electrical tools, instruments and required materials **Task (What):** Repair / replace socket outlets/plugs of the wiring systems. **Standards (How well):** Socket outlets/plugs of the wiring systems repaired and replaced.	➢ Number of wire permitted in the junction box ➢ Wire sizes, capacity and uses ➢ Types of wire / cables ➢ Socket outlets, terminal and connection points and pins. ➢ Procedure ➢ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hard wares and wiring cables and materials, fixing boxes test lamp/phase tester.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Time : 2 hrs
Theory: hrs
Practical: 2 hrs

Task No: 22 Repair / replace switch of wiring systems.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions 2. Collect necessary tools, equipment & materials. 3. Inspect visually switch points and circuits of wiring system. 4. Check connection points for malfunction. 5. Identify problems. 6. Repair and maintain the faults. 7. Test circuits. 8. Pre-commission the circuit. 9. Operate the circuit. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Repairable existing wiring, necessary electrical tools, instruments and required materials . **Task (What):** Repair / replace switches of wiring systems. **Standards (How well):** Switch of wiring systems repaired and replaced.	➢ Procedure ➢ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hard-wares and wiring cables and materials, controlling accessories, fixing boxes test lamp/phase tester.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Time : 3 hrs
Theory: 1 hr
Practical: 2 hr

Task No: 23 Repair / replace ceiling rose.

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually ceiling rose of lighting and fan points of the system. 4. Check connection points for malfunction. 5. Identify problems. 6. Repair and maintain the faults. 7. Test circuits. 8. Pre-commission the circuit. 9. Operate the circuit. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Repairable existing wiring, necessary electrical tools, instruments and required materials **Task (What):** Repair / replace ceiling rose. **Standards (How well):** Ceiling rose repaired and replaced.	➢ Utilization of ceiling rose ➢ Function of ceiling rose ➢ Ceiling rose fitting procedure in the joist ➢ Fitting Clamps ➢ Moveable fittings ➢ Uses of flexible wire ➢ Procedure ➢ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hard-wares and wiring cables and materials, fixing boxes test lamp/phase tester.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 24 Repair / replace protective and overload devices.

Time : 6 hrs
Theory: 3 hrs
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions 2. Collect necessary tools, equipment & materials. 3. Inspect visually protective and over load devices of the wiring system. 4. Check connection points for malfunction. 5. Identify faults. 6. Repair and maintain the faults. 7. Test circuits. 8. Pre-commission the circuit. 9. Operate the circuit. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Repairable existing wiring, necessary electrical tools, instruments and required materials **Task (What):** Repair / replace protective and overload devices. **Standards (How well):** Protective and overload devices repaired and replaced.	➢ Three phase wiring (concept only) ➢ Principle operation of : ⊠ Fuse ⊠ MCB ⊠ MCCB ⊠ Ferrule type Fuse ⊠ Knife-edge (cartridge) fuse ⊠ HRC ⊠ Drop out fuse (DO Fuse) ⊠ Time-delay fuse ⊠ Time clock switch ⊠ Circuit breaker ⊠ Ground fault circuit interrupters (GFCI) ⊠ Screw type fuse ⊠ Dimmer ⊠ Pilot light attached with the switch ⊠ Clock attached with the switch ➢ Procedure ➢ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hard-wares and wiring cables and materials, fixing boxes, fuses and protective devices, test lamp/phase tester.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 25 Perform troubleshooting of the Lamps / Tubes / doorbells.

Time : 5 hrs
Theory : 2 hrs
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually Lamps / Tubes / doorbells of the wiring system. 4. Check connection points for malfunction. 5. Identify faults. 6. Repair and maintain the faults. 7. Test circuits. 8. Pre-commission the circuit. 9. Operate the circuit. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Repairable existing wiring, necessary electrical tools, instruments and required materials **Task (What):** Perform troubleshooting of the Lamps / Tubes / doorbells. **Standards (How well):** Lamps / Tubes / doorbells Troubleshoot. Lamps / Tubes / doorbells repaired / replaced.	➢ **Nature of failures of:** ⊠ Overheating ⊠ Open circuit ⊠ Short circuit ⊠ Loose connection ⊠ Sparking between connections ➢ **Remedies** ⊠ Checking and Inspection Identification of problem ⊠ Diagnosis procedures ⊠ Connection diagram of tube light ⊠ Procedure ⊠ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hard wares and wiring cables and materials, fixing boxes, lamp set and/or individual parts of the lamps, test lamp/phase tester.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 26 Install/ connect earthing electrode.

Time : 5 hrs
Theory: 3 hrs
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions 2. Collect necessary tools, equipment & materials. 3. Locate earthing points. 4. Make routes for earthing conductors 5. Dig holes for earthing 6. Prepare for earthing electrodes. 7. Erect and position electrodes. 8. Put charcoal & salt in number of alternative layers 9. Backfill holes. 10. Template surface of the fill 11. Pour water as required through the pipe. 12. Install & connect earthing conductors. 13. Install & connect earthing connation to the wiring system. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 16. Keep records.	**Condition (Given):** Site, necessary electrical tools, instruments and required materials . **Task (What):** Install and connect earthing electrode. **Standards (How well):** Earthing electrode installed according to the electrical code of practice. Earthing electrode connected.	➢ **Earthing** ⊠ Definition ⊠ Importance ⊠ Functions ⊠ Sizes ⊠ Type (System, equipment) ➢ **Electrode** ⊠ Definition ⊠ Importance ⊠ Functions ⊠ Types ⊠ Sizes ➢ **Earthing conductors** ⊠ Definition ⊠ Importance ⊠ Functions ⊠ Types ➢ **Earthing Materials** ⊠ Charcoal ⊠ Salt ⊠ Water ⊠ Clamps ⊠ Pipes ⊠ Conductors ➢ Electrical code of practice or NEA rules for Earthing ➢ Procedure ➢ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hard-wares and wiring cables and materials, spade, shovel, pick, earth electrodes, pipe, salt, charcoal, sand clay earth electrode plate as per specifications.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 27 Lay PVC pipe for conceal wiring.

Time : 3 hrs
Theory: hrs
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Interpret drawing. 4. Identify location of junction. 5. Identify location of accessories and fittings. 6. Identify location of cable running routes. 7. Identify location of distribution units. 8. Lay PVC pipe in routes as per drawing 9. Bind PVC pipe as per standard. 10. Reexamine the position of PVC pipe. 11. Clean all tools & equipment & put at proper place 12. Clean working place. 13. Keep records.	**Condition (Given):** Site/workshop, necessary electrical tools, instruments, drawing and required materials **Task (What):** Lay PVC pipe for conceal wiring. **Standards (How well):** Location of junctions identified. Location of cable routes of accessories and fittings identified. Location of cable running routes identified. Location of distribution units identified. PVC pipe laid.	➢ Procedure ➢ Safety precautions

Tools/equipment: PVC pipes, binding wires, wages, drawing specifications, instructions
Safety: Safe and careful movement around the construction site

Task Analysis

Task No: 28. Draw wire/cable through PVC pipe applying fish wire.

Time : 3 hrs
Theory: hrs
Practical: 3 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions 2. Collect necessary tools, equipment & materials. 3. Interpret drawing. 4. Draw wire/cable to cable running routes 5. Draw wire/cable to junction. 6. Draw wire/cable to accessories and fittings. 7. Draw wire/cable to cable running routes distribution units. 8. Mark wires/cables for 9. Individual connections. 10. Clean all tools & equipment & put at proper place 11. Clean working place. 12. Keep records.	**Condition (Given):** Site/workshop, necessary electrical tools, instruments and required materials **Task (What):** Draw wire/cable through PVC pipe applying fish wire. **Standards (How well):** Wire/cable drawn through PVC pipe as per standard and drawing.	➢ Procedure ➢ Safety precautions

Tools/equipment: Set of wiring tool kits, pulling/fish wire, different color of insulation tape for identification marking.
Safety: Safe use of hand tools, safe and careful movement around the construction site

Task Analysis

Task No: 29. Install/ connect accessories/fittings/protective devices/ distribution board.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions 2. Collect necessary tools, equipment & materials. 3. Interpret drawing. 4. Obtain accessories/fittings 5. /protective devices/ distribution board. 6. Install/connect wire/cables with accessories 7. Install/connect wire/cables with fittings. 8. Install/connect wire/cables with protective devices. 9. Install/connect wire/cables with distribution units. 10. Check and test installations/ connections. 11. Carryout pre commissioning test. 12. Energize installation systems. 13. Check operation. 14. Clean all tools & equipment & put at proper place 15. Clean working place. 16. Keep records.	**Condition (Given):** Site, necessary electrical tools, instruments, drawing and required materials **Task (What):** Install/ connect accessories/fittings/protective devices/ distribution board. **Standards (How well):** Accessories, fittings, protective devices and distribution board installed and connected. Pre commissioning test carried out.	➢ Connection system ➢ Concept of pre commissioning test ➢ Procedure ➢ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hard-wares and wiring cables and materials, spade, shovel, pick, earth electrodes, pipe, salt, charcoal, sand clay earth electrode plate as per specifications.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

Task Analysis

Task No: 30 Install wiring system in a house with smart facilities (Project works).

Time : 20 hrs
Theory : 2 hrs
Practical: 18 hrs

Performance steps	Terminal Performance Objective	Related Technical Knowledge
1. Receive instructions / order 2. Visit site 3. Consult with client 4. Finalize the contract 5. Prepare plan 6. Prepare wiring layout and design 7. Collect necessary tools, equipment & materials 8. Locate points, outlets, positions of accessories 9. Draw wires including earth conductors run through the houses 10. Fix boxes, accessories and fittings 11. Connect accessories and fittings 12. Draw earth electrodes. 13. Test entire installation system 14. Perform commission test 15. Check and energize wiring system 16. Operate system 17. Handover to the owner 18. Clean all tools & equipment & put at proper place 19. Clean working place. 20. Keep records.	**Condition (Given):** Site, necessary electrical tools, instruments, drawing and required materials **Task (What):** Install wiring system in a house with smart facilities. **Standards (How well):** Wiring system in a house installed with smart facilities as per demand of client.	➢ Types of wire use in house wiring ➢ Types of protective devices and circuit breakers ➢ Use of alarming devices ➢ Use of electrical appliances and lighting fixtures ➢ Selection and use of tools and materials ➢ Estimating and costing ➢ Procurement procedure ➢ Bidding procedure ➢ Types of Controlling devices ➢ Procedure ➢ Safety precautions

Tools/equipment: Set of wiring tool kits, technical wiring layout diagram, fixing hard-wares and wiring cables and materials, recessing equipments, power drilling machine, drill bits of appropriate sizes.

Safety:

- Safe use of hand tools, sharpened tools, application of safe practice, use of first aid, if needed.
- Safe work with live line.

OJT for Construction Technician

Overview of OJT

On the Job Training is an individual training approach designed to train the learner to perform certain task while working in the job. It makes use the working environment as the training facility. Training is relevant as the learner is being trained in a real work setting. The aim of the On the Job Training (OJT) is to provide the learner the maximum experience & exposure of "The World of Work".

In one occupational set up, it is not possible to expose the trainees for all required competencies that they have to master to perform their future job. Moreover, trainers and institution management should take precaution while planning for the OJT placement. Therefore, it is suggested to plan the OJT placement on rotating modality so that the trainees will have enough opportunity to practice the skills enlisted for OJT exposure.

Objectives of OJT

After completion of OJT the trainees will be able to:

1. To practice/ apply the skills/ knowledge developed by the trainees through institutional training in the real world of the related occupation
2. To practice the skills gained through institutional training that the trainees have not got enough opportunity to practice and apply them due to the institutional constraints and or limitation
3. To gain world of work experiences
4. To acquire skills and knowledge developed in the related field of occupation
5. To make trainees familiar with the future occupation/ job they are going to hold
6. To provide trainees with supporting skills and knowledge necessary for the related occupation
7. To make trainees familiar with the day to day administrative / management activities applicable in their related occupation.

OJT placement

The related training institute needs to perform the followings for OJT placement of the trainees.

Make list of the employer agencies:

1. Make list of the Employer agencies:
   (a) Construction industries run by the government / Private agencies
   (b) Construction industries run by NGOS / INGOS
   (c) Construction projects
   (d) Others
2. Select the employer agencies / related industries:
   (a) Obtain the curriculum
   (b) Match the skills specified in the curriculum with the occupational activities being conducted by industries.
   (c) Select the employer agency for OJT which: -
      - Is well equipped and can provide maximum opportunity to practice /develop / apply the skills and knowledge included in the curriculum
      - Can provide recently developed knowledge / skills in the related occupation
      - Has the possibility to offer job for the trainees having satisfactory job performance after the completion of OJT.
      - Can offer facilities to the trainees during OJT.
3. Contact employer agency for OJT

4. Make agreement with employer agency regarding OJT.
5. Orient the employer regarding supervision & evaluation of the trainees on OJT.
6. Assign the trainees who have passed institutional training to the selected employer agencies
7. Orient the trainees for OJT (Objectives, curriculum, activities in which they have to be involved, recording, supervision & evaluation etc.)
8. Send Trainees with official letter for OJT.
9. Manage / provide salary (at least to cover the living cost) to the trainees.
10. Have initial supervision to help socialize and guide the trainees sent for the JOT.
11. Have periodic supervision and evaluation of the trainees at least three times at an interval of two months during the period of OJT.
12. Collect feedback as inputs for the revision of the curriculum for future.
13. Keep records.

Orientation to the Trainees for OJT

The trainees who are placed on OJT are to be oriented by the related institute about the followings:

1. OJT Activities
2. OJT Evaluation
3. OJT curriculum

Suggestion for Trainees for OJT

1. Receive orientation for OJT provided / delivered by the related Training institute
2. Obtain curriculum
3. Obtain official letter for Joining OJT
4. Contact the assigned organization
5. Maintain attendance
6. Manage Accommodation
7. Obtain Job description
8. Visit / observe the activities related
9. Study critically the related units of industry
10. Obtain curriculum
11. Match the tasks specified in the curriculum with the actual tasks / activities being carried in the industry.
12. Make lists of tasks:
    (a) You need to practice for confidence building
    (b) You need to practice the skills that are not covered in the institutional Training
    (c) You need to practice the skills that are not included in the curriculum but need to perform in the real world of the occupation for successful OJT performance.
    (d) Recently developed skills through research applicable to your level of job after OJT.
13. Finalize the Task list consulting with:
    (a) Your supervisor &
    (b) Instructor
14. Practice / perform / develop as many related skills as possible related to your level of job.
15. Perform related administrative functions.
16. Perform / develop skills on cue the duties and tasks specified in the job description provided by the employer during OJT.
17. Get help form the senior (s) / supervisor (s) to perform the tasks \develop skills as maximum as possible.
18. Develop daily diary / Log book
19. Fill the daily diary / Log book

20. Get signed by your supervisor regularly
21. Seek & follow suggestion from seniors
22. Show excellent job performance to influence your senior (s) / supervisor so that they could will recommend to the employer to offer you the job after OJT.
23. Develop professionalism.

OJT Evaluation

The OJT will be evaluated by:

a. Related supervisor of organization
b. Related instructor/supervisor of the training institute
c. CTEVT (representative or assigned expert if needed)

The marks distribution for the OJT evaluation of the trainees will be as follows:

S.N.	**Evaluators**	**Marks Distribution**	
		Full Marks	**Percentage**
1.	Related supervisor of the industries / organization	200	50%
2.	Related supervisor / instructor of the training institute	100	25%
3.	External expert	100	25%
Total		**400**	**100%**

Competencies to be performed during OJT

Trainees are suggested to perform all the critical competencies mentioned above under each module of this **Construction Technician** curricular program

Physical Facilities

The theory class rooms at least should have area of 10 square feet per trainee and in the workshop it should be at least of 30 square feet per trainees. All the rooms and laboratory should be well illuminated and ventilated.

- Workshop (Masonry) -1
- Plumbing workshop -1
- Electrical workshop - 1
- Drawing room -1
- Class room -1
- Office room -1
- Principle room -1
- Faculty room -1
- Reception room -1
- Library - 1
- Store room -1
- OHP -1

For Basic Drawing

1. Compass
2. Drawing board
3. Flexible curve
4. French curve
5. Protractor
6. Rule and Scale
7. Scale set
8. Set-square
9. Templates
10. T-square

For Masonry and Tile fitting module

1. Abney level
2. Bolster
3. Boot
4. Brick hammer
5. Bucket
6. Builder square
7. Cane basket
8. Chisel
9. Cue box
10. Die
11. Doko
12. Float
13. Gauge box/ Batching box
14. Grinder
15. Grinding stone

16. Hacksaw frame and blade
17. Hammer
18. Hawk
19. Helmet
20. Knife / brick cutter
21. Level pipe
22. Line and pins
23. Mallet
24. Measuring tape
25. Mixing board
26. Mortar pan
27. Paw
28. Picks
29. Pipe level
30. Plumb bob
31. Pointer
32. Pointing key
33. Pointing trowel
34. Saw
35. Shovel
36. Spirit level
37. Sponge
38. Straight edge
39. Tiling towel
40. Trowel
41. Try square
42. Water can
43. Wire brush
44. Wooden stroke

For Shuttering Carpentry, Scaffolding and Bar Bending

1. Back saw
2. Bar binding key
3. Bar clamp
4. Bar cutter machine
5. Basila
6. Butt gauge
7. Carpenter's level
8. Chisel
9. Chisel (Different size)
10. Claw hammer
11. Combination square
12. Cross cut saw
13. Crow bar
14. Folding tape
15. Fork
16. Hammer
17. Hand drill
18. Jumper
19. L square
20. Line level
21. Mallet
22. Marking gauge
23. Measuring tape

24. Nail puller
25. Nail punch
26. Pencil
27. Pincer
28. Pliers
29. Plumb bob
30. Rip saw
31. Scratch awl
32. T- bevel

For Plumbing sub module

Cutting tools

1. Chisel
2. Hacksaw
3. Mitre saw
4. Pad saw
5. Pipe cutter
6. Pocket knife
7. Reamer
8. Scissor
9. Wood saw

Hammering tools

1. Ball hammer
2. Motion Hammer
3. Pin hammer
4. Spin hammer

Vice and Wrenches

1. Adjustable wrench
2. Bench vice
3. Chain vice
4. Pipe vice
5. Pipe wrench
6. Screw driver
7. Spanner Set

File set

1. Half run file
2. Needle file set
3. Square file
4. Triangle file
5. Wooden file

Measuring tools

1. Bottom square
2. Folding tape
3. Hook tape
4. Marking tool
5. Measuring tape
6. Plumb bob
7. Spirit level

Heating tools

1. Blow lamp
2. Heating plate

Other Tools

1. Combination pliers
2. Hand drill
3. Nose pliers
4. Vice pliers

Equipment

1. Air pressure pump
2. Allen key set
3. Circlip pliers set
4. Die sets
5. G.F. machine
6. Grinder
7. Pillar drill machine
8. Tapping machine
9. Vernier callipers
10. Water pressure pump

For House Wiring sub module

1. Ammeter meter
2. Cable drum
3. Chisel
4. Drill machine and bits
5. Energy meter
6. Fish wire
7. Hacksaw
8. Hammer
9. Insulation tester
10. Measuring tape
11. Megger
12. Multi-meter
13. Ohmmeter
14. Phase tester
15. Pliers
16. Punch
17. Screwdriver(flat and Phillips)
18. Torch light
19. Voltmeter
20. Wattmeter
21. Wiring board

Suggested Reading Materials

For Basic English

Grant Taylor, *English Conversation Practice* Tata MC Graw-Hill Publishing Company Ltd., 1975.

For Basic Drawing

1. Newa, Dilli Raj *Technical Drawing* CTEVT, 2050.
2. Bhatt N.D., *Elementary Engineering Drawing (Latest Edition)*, Chartor Publishing House India.
3. Lakshminarayan V., A Text Book on Practical Geometry (Latest Edition).
4. Singh Gurucharan, *Civil Engineering Drawing* (Latest Edition).
5. Malice S.K., *Civil Engineering Drawing* (Latest Edition).
6. Singh Gurucharan *Text book of Engineering Drawing* (Latest Edition).
7. C.R.Dargan, *Electrical Drawing and Estimating*.

For Entrepreneurship Development

मानन्धर देवेन्द्र , *उद्यमशीलता विकास,* प्रा.शि.तथा व्या.ता. परिषद् २०५३ ।

For Generic Skills

1. Life Skills, *A facilitator's guide for teenagers*, unicef.

For Masonry, Tiling, Shuttering Carpentry, Scaffolding and Bar Bending

1 Galami T.B., *A Text Book of Construction (Part -I)*, CTEVT.

2 अधिकारी राजेन्द्र प्रसाद र के.सी. अर्जुन *भवन निर्माण,* प्रा.शि.तथा व्या.ता परिषद् २०५४ ।

3 Punmia B.C. Dr., *Building Construction* (Latest Edition).

4 Kumar Sushil *Building Construction* (Latest Edition).

5 Sharma S.K. & Kaul B.K., *Building Construction* (Latest Edition).

6 Singh Gurucharan, *Building Planning & Design* (Latest Edition).

7 Department of Urban Development, *Nepal Building Code.*

8 Nepal National Building Code, *Material Specification,* Department of Building, 1995.

9 Rural Building Course, *volume I, II and III.*

10 Arya A.S., *Masonry and Timber Structure including Earth* (Latest Edition).

11 Jain, *Plain Cement Concrete, Vol I & II* (Latest Edition).

12 Kumar Sushil, *Reinforced Concrete Structure* (Latest Edition).

13 Punmia B.C. Dr. *Reinforced Concrete Structure, Vol. I & II* (Latest Edition).

14 ब्यन्जनकार मोहनमान , *गाह्रो लगाउने प्रविधि* ।

15 चौधरी महेश कुमार , *गाह्रो लगाउने प्रविधि* ।

16 शिलाकार, दोब्बरलाल, *काष्ठकार्यको परिचय (An Introduction of Wood Work),* प्रथम संस्करण २०५४ ।

17 पनेरु, पूर्णानन्द, *भवन निर्माण आधारभूत ज्ञान,* २०६२ ।

For Plumbing

1. *Drinking Water Installation and Drainage Equipment in Nepal*, SKAT.
2. *Gravity Water Supply System in Nepal*, UNICEF.
3. Birdie G.S., Birdie J.S. *Water Supply and Sanitary Engineering*,
4. Deolakar S.G., *Plumbing Design and Practice*, Tata Mc Graw-Hill Publishing Company Limited, 1994.
5. McConnell, Charles, 1986, *Plumbers and pipe Fitters Library, volume I, II, and III*, Macmillan Publishing Company, 1986.

For Electricity

1. Heinz Graff, *Electrical Installation.*

2. Code of Practice for Electrical Wiring Installation, CTEVT.

3. S.K.Malice, *Electric Trade Theory and Practical* .

4. Electric Trade Technology, CTEVT.

5. Skill Standard Level 2 CTEVT.

6. B.L. Thereja, *Text Book of Electrical Technology*.

7. थापा, भोज विक्रम, *भवन तथा औद्योगिक विद्युत जडान,* २०६२ प्रा. शि. तथा व्या. ता. परिषद्,

8. श्रेष्ठ जीवनहरि तथा साथीहरु, *प्रारम्भिक विद्युत,* पाठ्यक्रम विकास केन्द्र त्रि. वि.वि. इ.स .१९८१

Experts involved

Content Experts
Dev Narayan Rahathi, Gulmi

Dipendra Prasad Sharma, Saptari

Ganeh Kumar Bhandari, Kathmandu

Gokarna Rai, Khotang

Kailash Prasad Singh, India

Lekh Ratna Shakya, CTEVT

Mister Kant Mainali, CTEVT

Narayan GM, Dang

Nawa Raj Adhikari, Dang

Prakash Maharjan, Lalitpur

Pramod Kumar Yadav, Danusha

Purna Nanda Paneru, Vaidhnath Engineering College, Mahendranagar

Raghubar Lal Joshi, BTTC

Ram Dev Sharma, Saptari

Ram Narayan Shah, Siraha

Rameh Man Shakya, TITI, Bhaktapur

Ranjit Kumar Thakur, Siraha

Saroj Upadhaya**,** CEMECA Human Resources Development, Kathmandu

Suraj Khanal, Dang

Surendra Kumar Singh, India

Tak Bahadur Galami, Institute of Engineereing, Laitpur

Yadu Bangsi Lal Karna, Siraha

Process Experts
Bishnu Koirala, CTEVT

Devi Prasad Dahal, TfE

J.C. Dahal, CTEVT

Mister Kant Mainali, CTEVT

Dr. Ram Hari Lamichhane, TfE

Sagar Mani Lamsal, CTEVT

Shiva Shankar Ghimire, CTEVT

Srijana Thapa, TfE