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

COMPETENCY BASED CURRICULUM

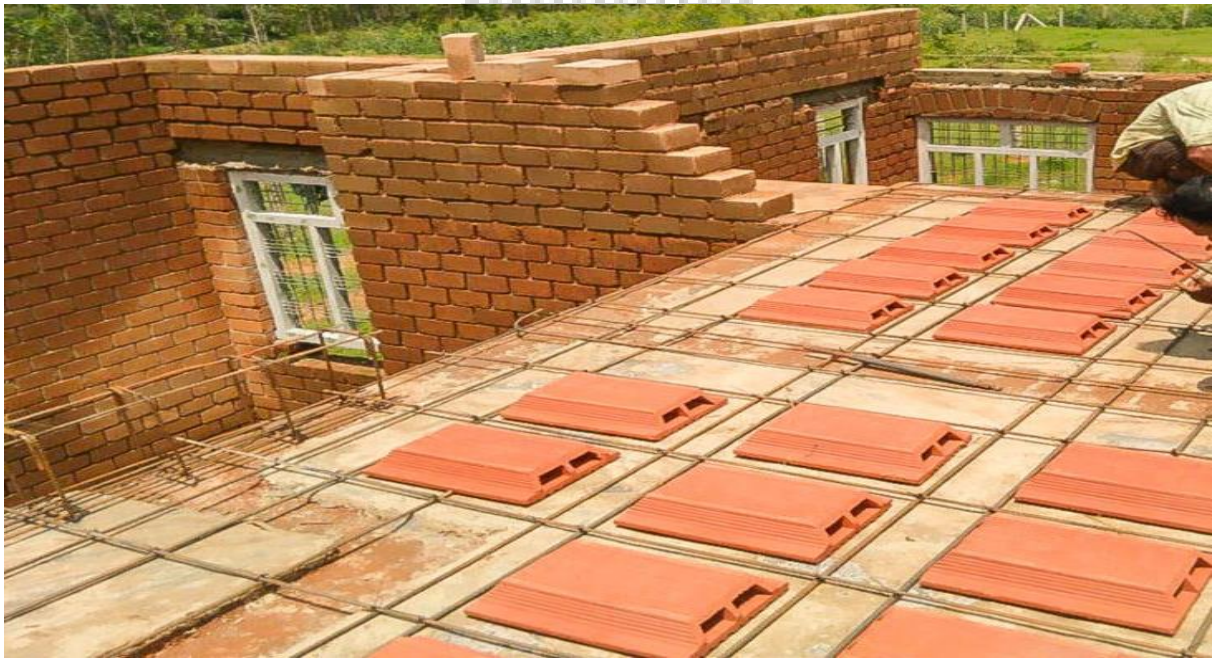
BAREFOOT TECHNICIAN

(Duration: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

(Flexi MoU)

NSQF LEVEL- 4



SECTOR – CONSTRUCTION

Directorate General of Training

Skill India
कौशल भारत - कुशल भारत

BAREFOOT TECHNICIAN

(Engineering Trade)

(Designed in 2021)

Version: 1.0

CRAFTSMEN TRAINING SCHEME (CTS)

(Flexi MoU)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship

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1. COURSE INFORMATION

During the two-year duration a candidate is trained on subjects viz. Professional Skill, Professional Knowledge, Workshop Science & Calculation, Engineering Drawing and Employability skills. In addition to this a candidate is entrusted to make/do project work and Extra Curricular Activities to build up confidence. The practical skills are imparted in simple to complex manner & simultaneously Professional Knowledge (theory subject) is taught in the same fashion to apply cognitive knowledge while executing task. The practical part starts with simple geometrical drawing and finally ends with preparing topographical map, Cadastral/ mouza map, detailed road project, survey drawing using CAD, application of GIS techniques, Hydrographic survey, Transmission line site survey, railway line site survey, sanction plan of Residential / Public building, and detailed estimate. The year wise course coverage is categorized as below:-

FIRST YEAR: In the beginning of the course the trainees are acquainted with occupational safety & health, PPE, etc. The practical part starts with basic drawing (consisting of lettering, numbering, geometrical figure, symbols & representations). Later the drawing skills imparted are drawing of different scales, projections, perform site survey and prepare a site plan using chain / tape, prismatic compass, perform AutoCAD drawing. Observation of all safety aspects is mandatory. The safety aspect covers components like OSH&E, PPE, Fire extinguisher, First Aid, etc. Knowledge and application of Computer Aided Drawing. workspace creating drawing using toolbars, commands, and menus. Plotting drawing from CAD. Different site survey using Plane table (radiation, intersection, traversing, determination of height), Theodolite (measurement of angle, traversing, computation of area), Levelling instrument (different levelling – differential, reciprocal, etc.), tachometer (determination of horizontal and vertical distance, constants, etc.), field book entry, plotting, mapping, calculation of area, preparing traverse drawing, simple building drawing using CAD are being taught in the practical.

SECOND YEAR: Making topographical map using Level instruments with contours (Interpolation of contour, preparation of section, computation of volume, setting of simple, compound, reverse, transition and vertical curve), performing survey using Total Station and preparation of map (measurement of angle, co-ordinates and heights, downloading survey data and plotting), making of site plan by Cadastral survey (preparation of site plan, calculation of plot area, etc.), performing road project survey (location survey and preparation of route map, profile/ longitudinal / cross sectional levelling and plotting) and survey drawing using CAD.

Drawing of projection, setting and application of GIS & GPS techniques in various fields, collection and processing of data, performing hydrographic survey (determining hydrographic depth, measuring velocity of flow, determining cross sectional area of river, calculating the discharge of a river, etc.), performing transmission line site survey (making of alignment, conducting detailed survey, final location survey and making of tower foundation pit point), performing railway line site survey, drawing of building by CAD and preparation of estimation are being done as part of practical training.

2. TRAINING SYSTEM

2.1 GENERAL

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

K.K. Techno Solution Pvt. Ltd. shall conduct courses pan-India locations leveraging the facilities and services available at ITIs, regional training centers, training centers of training partners, vendors and dealers associated with K.K. Techno. They will ensure that not less than 50% of trainees are placed with K.K. Techno or its business partners for not less than Two years duration. It will also ensure the eligible trainees take up Apprenticeship / higher education in suitable streams and shall also guide the students to become Entrepreneurs. K.K. Techno Solution Pvt. Ltd. will strictly follow the policy guidelines for Flexi - MoU as in place from time to time. No deviation for the same would be permitted. Every Alternate Month Admission and Exam for trades run under Flexi MoU at training locations of K.K. Techno. Theory content to be 30% and practical content to be 70%.

Broadly candidates need to demonstrate that they are able to:

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

2.2 PROGRESSION PATHWAYS

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

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of two years:

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	3270
2	Professional Knowledge (Trade Theory)	930
3	Employability Skills	180
	Total	**4380**

2.4 ASSESSMENT & CERTIFICATION

I. Conducting training of selected candidates is the sole responsibility ofIndustrial Training Partner (ITP).

II. Assessment will be jointly done by ITP and DGT. Practical and formative assessment shall be conducted by ITP, and Computer Based theoretical exams shall be conducted by DGT.

III. ITP must refer to the latest examination reform guidelines issued by DGT dated 4thOctober 2018 any changes or revisions to the same shall be applicable to flexi-MoU scheme.

IV. Maximum attempts for clearing the exam and obtaining NTC shall be in line with CTS.

V. For practical examination and formative assessment, ITP has been given flexibility to design the questions, assess the candidates and upload their marks in the scheme portal.

VI. ITP shall develop a comprehensive Question Bank (in English and Hindi) of minimum 1000 questions, grouped by chapters and difficulty level. The same shall be vetted by NIMI experts and then be handed over to DGT for conducting theory exams. DGT may add some questions to the same before conducting actual exams.

VII. Theoretical exams shall be conducted by DGT in Computer Based Test format. Upon completion of course and payment of requisite examination fee by ITP, admit cards shall be generated by scheme portal.

VIII. DGT shall arrange for conduct of computer based theory exam at designated examination centres & certify the successful trainees with e-NTC under flexi-MoU scheme with mention of ITP name in the Certificate.

IX. Students, who have successfully appeared in the final exam after completion of course, are eligible to register as apprentices.

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

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

The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The examiner during final examination will also check the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percentage for practical is 60% & minimum pass percentage of theory subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

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

Assessment will be evidence based comprising the following:

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

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

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	

For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Bare Foot Technician (BFT) is also known as the Bare Foot Engineer is needed at village level in rural India to provide technical support to the infrastructure activities and works taken up under MGNREGS, to improve the quality and durability of the assets to be created. The role involves working as a Junior Technical Assistant and perform tasks under the instruction and guidance of the Technical Assistant/Junior Engineer/Assistant Engineer. The individual is expected to carry out the functions of Technical Assistant/Overseer/Work Inspector in providing technical services at village level such as identification, setting and layout, supervise for ensuring the quality and specifications of works taken up under MGNREGS. The individual should ensure activity specific compliance to environment, health and safety aspects while executing the works.

Reference NCO-2015:

a) 3142.0201 - Bare Foot Technician (BFT)

4. GENERAL INFORMATION

Name of the Trade	**Barefoot Technician (Flexi MoU)**
Course Code	DGT/7021
NCO - 2015	3142.0201
NSQF Level	Level-4
Duration of Craftsmen Training	Two years
Entry Qualification	Passed 10thClass examination
Minimum Age	16 years as on first day of academic session.
Unit Strength (No. Of Student)	20
Space Norms	64 Sq. m.
Power Norms	3 KW
Instructors Qualification for	
1. Barefoot Technician Trade	Degree in Civil Engineering from recognized university with one year experience in relevant field. **OR** NTC/NAC in the Trade of "Barefoot Technician" With 3 years' post qualification experience in the relevant field. **Desirable: -** Preference will be given to a candidate with CIC (Craft Instructor Certificate). ***Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.***
2. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience **w**ith **short term ToT Course in** Employability Skills from DGT institutes. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) **OR** **Existing Social Studies Instructors in ITIs with short term ToT Course in** Employability Skills from DGT institutes.
5. Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

5. NSQF LEVEL COMPLIANCE

NSQF level for **Barefoot Technician** trade CTS (Flexi MoU): **Level-4.**

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

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

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

a. Process
b. Professional Knowledge
c. Professional Skill
d. Core Skill
e. Responsibility

The broad learning outcome of **Barefoot Technician** trade under CTS (Flexi MoU) mostly matches with the Level descriptor at Level- 4.

The NSQF Level-5 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 4	Work in familiar, predictable, routine, situation of clear choice.	Factual knowledge of field of knowledge or study.	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts.	Language to communicate written or oral, with required clarity, skill to basic Arithmetic and algebraic principles, basic understanding of social political and natural environment.	Responsibility for own work and learning.

6. LEARNING OUTCOME

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

6.1 GENERIC LEARNING OUTCOMES (Employability Skills)

1. Introduction to Employability Skills
2. Constitutional values - Citizenship
3. Becoming a Professional in the 21st Century
4. Basic English Skills
5. Career Development & Goal Setting
6. Communication Skills
7. Diversity & Inclusion
8. Financial and Legal Literacy
9. Essential Digital Skills
10. Entrepreneurship
11. Customer Service
12. Getting Ready for Apprenticeship & Jobs

6.2 SPECIFIC LEARNING OUTCOMES

FIRST YEAR

1. Concept of drawing & sheet layout following safety precautions.
2. Draw lettering & numbering applying drawing instruments.
3. Draw plain geometrical figures, curves & conics.
4. Construct plain scale, diagonal scale, comparative scale, vernier scale.
5. Draw orthographic projections of different objects with proper dimensioning & lettering.
6. Draw conventional signs & symbols used in surveying.
7. Perform site survey using chain/ tape & prepare a site plan.
8. Identify, select & apply masonry materials and prepare foundation bed.
9. Prepare detailed estimate and cost analysis of different types of building and other structures by applying various methods and prepare estimate of work.
10. Construct sub structures and perform Excavation work.
11. Identify & repair the building cracks and perform maintenance work of building.
12. Read and apply engineering drawing for different application in the field of work.
13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.

SECOND YEAR

14. Perform the site survey using prismatic compass.

15. Perform the site survey using the plane table.
16. Prepare estimate of two room building & Drainage work.
17. Execute methods of safety in construction works.
18. Perform Dumpy Level survey.
19. Perform traverse survey by Theodolite & prepare a site map.
20. Prepare estimate of 1KM road & culvert.
21. Execute complete finishing of building and establish Building services.
22. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

SPECIFIC LEARNING OUTCOME	ASSESSMENT CRITERIA
FIRST YEAR	
1. Concept of drawing & sheet layout following safety precautions.	10.1 Ensuring data & information received are sufficient for preparation of drawing
	10.2 Preparing layout of drawing sheet
	10.3 Preparing a title box
	10.4 Setting up & fixing drawing paper on the drawing board
2. Draw lettering & numbering applying drawing instruments.	11.1 Drawing horizontal line, vertical line, parallel line using T-square, set- square
	11.2 Drawing different types of lettering
	11.3 Drawing numbers in different fonts
	11.4 Drawing different types of lines
	11.5 Dimensioning a drawing. (various types)
3. Draw plain geometrical figures, curves & conics.	12.1 Drawing geometrical figures from given data (different types)
	12.2 Constructing ellipse and parabolic curves using the various conditions given
4. Construct plain scale, diagonal scale, comparative scale, vernier scale.	13.1 Drawing different types of scales.
	13.2 Finding out R.F of the scale, calculate the length of the scale on drawing
	13.3 Checking the drawing to confirm their correctness
5. Draw orthographic projections of different objects with proper dimensioning & lettering.	14.1 Developing view in orthographic projection by placing object between horizontal & vertical plane of axis.
	14.2 Generating side view of blocks in different inclination on V.P & H.P by auxiliary vertical plane.
	14.3 Constructing an isometric scale to a given length.
	14.4 Drawing the isometric projection of regular solids.
6. Draw conventional signs & symbols used in surveying.	15.1 Draw some conventional signs & symbols used in topographic maps.
7. Perform site survey using chain/ tape & prepare a site plan.	16.1 Performing surveying measuring distance by chain/ tape and other accessories
	16.2 Determining Errors in chaining and their corrections.
	16.3 Entering measured data in field book and plotting the same.

	16.4 Conducting chain surveying and prepare a site plan.
	16.5 Calculating area of a plot.
8. Identify, select & apply masonry materials and prepare foundation bed.	17.1 Identify masonry materials.
	17.2 Demonstrate use of basic tools and equipments.
	17.3 Identify different type of mortars.
	17.4 Observe precaution of mixing mortar.
	17.5 Demonstrate Construction material used in foundation bed.
	17.6 Apply process of lifting, Carrying and moving of mixing material
9. Prepare detailed estimate and cost analysis of different types of building and other structures by applying various methods and prepare estimate of work.	18.1 Identify types of estimates.
	18.2 Apply method of estimation: Plinth area rate method/ Cubical Content method/ Service Unit method/ typical bay method/ Approximate Quantity method.
	18.3 Perform Estimation of materials in buildings: walls, floors and roofs.
	18.4 Identify types of detailed estimate and its uses.
	18.5 Demonstrate general and detailed specifications for building works.
	18.6 Analyse rates and schedule of rates.
10. Construct sub structures and perform Excavation work.	19.1 Prepare job layout.
	19.2 Prepare layout for load bearing structure / framed structure by center line / face line method.
	19.3 Observe precautions while marking layout on ground.
	19.4 Execute excavation for foundation/ timbering /strutting.
	19.5 Earthwork for embankment/ material for plinth filling.
11. Identify & repair the building cracks and perform maintenance work of building.	20.1 Select maintenance items for up keeping the building.
	20.2 Determine approximate strength of structural members of old building and age of old building.
	20.3 Assess condition of existing buildings.
	20.4 Implement Local and global retrofit strategies.
	20.5 Identify cracks and determine cause of cracks.
	20.6 Repair and maintain the cracks.
12. Read and apply engineering drawing for different application in the field of work.	Read & interpret the information on drawings and apply in executing practical work.
	Read & analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.

13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	Solve different mathematical problems
	Explain concept of basic science related to the field of study
SECOND YEAR	
14. Perform the site survey using prismatic compass.	21.1 Measuring bearings of a line and conduct the traverse survey using prismatic compass & others accessories
	21.2 Making Entry in field book and Compute the correct bearings of the plot
	21.3 Plotting the traverse & adjust the closing error
	21.4 Calculating the area of the traverse
15. Perform the site survey using the plane table.	22.1 Setting up of plane table, leveling, centering& orientation. Surveying an area with plane table by radiation & intersection methods
	22.2 Traversing with plane table of built up areas, running an open traverse with plane table & fixing details
	22.3 Finding the position of table by three point & two point problems. Use of tangent &Disle's clinometers-Abney level and telescopic alidade for finding heights of surrounding points.
16. Prepare estimate of two room building & Drainage work.	23.1 Identify types of estimates.
	23.2 Drawings to attached with these estimates
	23.3 Prepare of rough cost estimates.
	23.4 Prepare a detailed estimate of two room building, complete with detailed reports, specifications, abstract of cost and material statement for pitched roof with steel truss only.
17. Execute methods of safety in construction works.	24.1 Observe electrical safety, hazards of electricity on a construction site.
	24.2 Select protective equipments.
	24.3 Demonstrate precaution to be taken from electric/ fire/ material handling.
	24.4 Use hand and power tools.
	24.5 Steps to be taken during emagencies
18. Perform Dumpy Level survey.	25.1 Identify use of dumpy level, temporary adjustments.
	25.2 Take reading on leveling staff, recording in the field book.
	25.3 Reduce level by height of instrument method / rise and fall method for differential leveling practice.
	25.4 Carry bench mark from one point to another point about

	1000m by height of instrument method.
	25.5 Carry bench mark from one point to another point about 800m by rise and fall method.
19. Able to Perform traverse survey by Theodolite, prepare a site map.	26.1 Locating contour lines by direct and indirect methods
	26.2 Preparing of sections from contour map; computation of volume by prismoidal formula, trapezoidal formula.
	26.3 Establishingf gradient using abney level, Ceylon ghat tracer and by using boning rod and sight rail.
	26.4 Plotting of contour maps. Uses of contour map.
20. Prepare estimate of 1KM road & culvert.	27.1 Preparation of detailed estimate of one km roads.
	27.2 Apply methods for calculating earth work- Average depth/ Average cross sectional area/ Graphical method.
	27.3 Calculate quantities of materials for roads in plains for one kilometre roads.
	27.4 Identify different type of culvert: Pipe culvert/ slab culvert/ hume pipe culvert/ rcc slab culvert/ box culvert.
	27.5 Prepare detailed estimate for box culvert span upto 6m/ hume pipe culvert upto 6m/ single span slab culvert upto 10m.
21. Execute complete finishing of building and establish Building services.	28.1 Demonstrate procedure of pointing.
	28.2 Prepare Surface for painting.
	28.3 Select suitable painting materials, white wash and color wash.
	28.4 Identify types building services, building management system/ energy generation/ distribution and supply, escalators and lifts, fire sefty, detection and protection, heating, ventilation and air conditioning.
	28.5 Water system, drainage and pumping.
22. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	Solve different mathematical problems
	Explain concept of basic science related to the field of study

8. SYLLABUS

SYLLABUS – BAREFOOT TECHNICIAN			
FIRST YEAR			
Hours.	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 32 hrs Professional Knowledge 08 hrs	Concept of drawing & sheet layout following safety precautions.	• Demonstrate of tools & equipment used in the trade. • Occupational safety & Health. • Introduction of safety equipments and their uses. • Introduction of first aid, health, safety & environmental guidelines, legislations & regulations as applicable. • Personal Protective Equipment (PPE). • Hazard identification and avoidance, Safety signs for Danger. • Use of drawing instruments and equipments with care. • Method of fixing of drawing sheet on drawing board. • Layout of different size of drawing sheet and folding of sheets.	Importance of safety and general precautions related to the trade. All necessary guidance to be provided to the newcomers to become familiar with the working of ITI system. Importance of survey or trade Job after completion of training. Introduction of First aid. Job responsibility of the trade. • Overview the subject to be taught. • List of the instrument equipments to be used during training • Layout of drawing sheet • Dimensions of drawing sheet.
Professional Skill 64 hrs Professional Knowledge 16 hrs	Draw lettering & numbering applying drawing instruments.	• Lettering & numbering (Single & double stroke) • Types of lines and dimensioning.	Details layout of lettering, lines & dimensioning system.
Professional Skill 32 hrs Professional Knowledge	Draw plain geometrical figures, curves & conics.	• Construction of plain geometrical figures, curves & conics.	Introduction of surveying, types of surveying, use, application principal.

08 hrs			
Professional Skill 32 hrs Professional Knowledge 08 hrs	Construct plain scale, diagonal scale, comparative scale, vernier scale.	Drawing of: - • Construction of scales – plain, diagonal, vernier.	Knowledge of different types of scales, determine of R.F & uses of scales.
Professional Skill 64 hrs Professional Knowledge 16 hrs	Draw orthographic projections of different objects with proper dimensioning & lettering.	• Drawing of three views in orthographic projection of point, line, plane, solid objects. • Section of solids. • Isometric projection of geometrical solids.	Different types of projection views orthographic, sectional, isometric view.
Professional Skill 32 hrs Professional Knowledge 08 hrs	Draw conventional signs & symbols used in surveying.	• Drawing of conventional signs & symbols. • Free hand sketch of liner measurement instruments.	Use & application of conventional signs & symbols.
Professional Skill 224 hrs Professional Knowledge 56 hrs	Perform site survey using chain/ tape & prepare a site plan.	**Survey** • Testing and adjustment of chain. Measurement of distance with chain about 1500m. • Line ranging with the help of ranging rod by direct ranging method. • Errors in chain • Line ranging with the help of ranging rod by indirect ranging method. • Construction and use of optical square and open cross staff for setting out perpendicular and running a survey line of locating details. • Measurement of distance on plain ground with the help of chain and tape. • Obstacles in chaining • Measurement of distance on	Chain survey, Introduction & Basic concepts:- Definition of chain survey, Classification of chain, Principle of chain surveying, Scale-Representation of scale. Study & Use of instrument:- Measurement of chain, tape, Ranging Rod, arrows, pegs, cross staff, optical square, line Ranger. :- Concept of Errors in measurement, Types of Errors-Gross errors, systematic errors, random errors, applying Correction for chain &Tape (Numerical problems), Errors due to use of wrong scale. Planning &carrying out chain survey:- Reconnaissance, selection of stations running survey lines, recoding field notes, plotting a chain survey-selection of scale, plotting of frame work, plotting

		slopping ground with the help of chain. • Plot the cross staff survey of field and calculate its area. • Plot Base line, Tie line, Check line, Main survey line on field book. • Draw the conventional symbols use in surveying. • Field work, basic problem in chaining.	of offsets, Title, scale, legends, inking in, coloring. Definition of obstacles, classification of obstacles, possibility of chain obstacles. Linear measurement:- different method, direct measurement, instrument for chaining – chain or tape, arrows, pegs, ranging rods, plumb bob, plasters laths &whites, chaining-follower & leader, folding & unfolding of chain, chaining on uneven or sloping ground by direct method &indirect method, first order measurement -base line measurement. Chain triangulation.
Professional Skill 288 hrs Professional Knowledge 72 hrs	Identify, select & apply masonry materials and prepare foundation bed.	**Masonry Material** • Learning to use the basic tools, Learning to case of basic tools, Learning to use and care related equipments. • Precaution of mixing mortar. Brick Masonry, Types of brick masonry, Bonds and types of bond use in brick masonry work, Arrangement and laying of material. • Stone masonry, Basic terms use in stone masonry work, Requirement of good quality building stone, Dressing of stone, Tools and plants use for stone masonry work. • Burning process of brick, Furnaces of clay brick, Types of furnaces. **Foundation** • Types of foundation, Construction material used in foundation bed, building brick	Masonry materials, Introduction, Tool and equipment used, Hand tools of the trade. Basic Material, Mortars –Cement mortars, Lime mortars, Mud mortars, Surkhi mortar, Concrete – Coarse aggregates , Fine aggregates, Cement –grade, types, test, Water , Bricks – Introduction, Texture, size, Types , Preparation of clay brick , Selection of bricks, Grade of brick. Rubble and Ashlar masonry their types, Mixing of mortars, Proportion mortar ingredients for specific mixes, Types of sand , Cement, Lime, Water and Mixing procedures, Tools and equipment used in masonry work by manually and machine. Process of lifting, Carrying and moving of mixing material

		work below D.P.C. • Understanding simple shoring. Precaution taken by execution work.	
Professional Skill 224 hrs Professional Knowledge 56 hrs	Prepare detailed estimate and cost analysis of different types of building and other structures by applying various methods and prepare estimate of work.	**Overview of estimating and costing** • Different methods of taking out quantities centre line into In/out methods. Estimation of materials in buildings: walls, floors and roofs • Types of detailed estimate and its uses. **Estimate of work** • R.C.C. works, plaster, white washing, distempering and doors and windows. • Principles of general and detailed specifications for building works, analysis of rates and schedule of rates.	Introduction: - what is estimating, purpose of estimating, estimate is never the actual cost, data required for preparation of an estimate, types of estimates, units of measurement. Types of estimate- Plinth area rate method, Cubical Content method, Service Unit method, Typical bay method, Approximate Quantity method. Detailed estimate, Revised estimate, Supplementary estimate, Revised & supplementary estimate and Maintenance & Repair estimate Principles of estimation, methods and units.
Professional Skill 320 hrs Professional Knowledge 80 hrs	Construct sub structures and perform Excavation work.	**Construction of sub structure** • Foundation - Wall footing, isolated and combined column footing, stepped foundation, raft foundation. • Deep foundation - Pile foundation – Types Bearing, friction, sheet, anchor, batter, fender piles. **Excavation work** • Cofferdams-Definition, types-Earthen, rock-fill, singled walled, double walled construction and use. • Under reamed pile foundation • Pumping method of dewatering, Bearing capacity of foundation soil	Job Layout :Site clearance, preparing job layout, layout for load bearing structure and framed structure by center line and face line method, precautions while marking layout on ground . Earthwork: Excavation for foundation, timbering and strutting Earthwork for embankment, material for plinth filling. Tools and plants used for excavation and earthwork. Foundation: Definition, purpose, Types of foundation. Shallow.
Professional	Identify & repair	**Building cracks & maintenance**	Cracks: Causes and types of

Skill 160 hrs Professional Knowledge 40 hrs	the building cracks and perform maintenance work of building.	• Maintenance items for up keeping the building. • Determination of approximate strength of structural members of old building and age of old building. **Repair and Retrofit:** • Introduction, repair, rehabilitation and retrofit, condition assessment of existing buildings. • Local and global retrofit strategies, flow chart of a retrofit program, repair materials. • Replacement of broken W.C. Seat and P-trap, batch repair for plaster, leakage through the roof. • Defects of floor and repair. • Maintenance of house pipe line and drainage system. • Sewer maintenance, cleaning of chocked residential sewer line.	cracks, identification of cracks. Size of cracks, safe of cracks, dealing with cracks. Guniting and grouting, use of epoxy and crack fills. Reason of cracks in building: elastic deformation, thermal movement, chemical reaction, shrinkage, ungraded aggregate, curing, excessive fine material. Principle Of Maintenance**:** Introduction, types of Maintenance, causes which necessitate the maintenance, inspection of building, routine building maintenance
Professional Knowledge WSC: 40 hrs ED: 38 hrs	Read and apply engineering drawing for different application in the field of work. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**Workshop Calculation & Science Unit, Fractions** Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, substraction, multiplication & division Decimal fractions - Addition, subtraction, multilipication & division Solving problems by using calculator **Square root, Ratio and Proportions, Percentage** Square and suare root Simple problems using calculator Applications of pythagoras theorem and related problems Ratio and proportion Ratio and proportion - Direct and indirect proportions Percentage Precentage - Changing percentage to	Engineering Drawing: Introduction to Engineering Drawing and Drawing Instruments – • Conventions • Sizes and layout of drawing sheets • Title Block, its position and content • Drawing Instrument 2 2. Free hand drawing of – • Geometrical figures and blocks with dimension • Transferring measurement from the given object to the sketches. • Free hand drawing of hand tools and measuring tools. 6 3. Drawing of Geometrical figures: • Angle, Triangle, Circle, Rectangle, Square, Parallelogram. 8 4. • Reading of dimension and Dimensioning Practice. 4 5. Symbolic representation – • Different

		decimal and fraction **Material Science** Physical and mechanical properties of metals Difference between iron & steel, alloy steel and carbon steel **Mass, Weight, Volume and Density** Mass, volume, density, weight and specific gravity Related problems for mass, volume, density, weight and specific gravity **Heat & Temperature and Pressure** Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals Scales of temperature, celsius, fahrenheit, kelvin and conversion between scales oftemperature Co-efficient of linear expansion **Mensuration** Area and perimeter of square, rectangle and parallelogram Area and perimeter of Triangles Area and perimeter of circle, semi-circle, circular ring, sector of circle, hexagon and ellipse Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder Finding the lateral surface area, total surface area and capacity in litres of hexagonal, conical and cylindrical shaped vessels **Trigonometry** Measurement of angles, Trigonometrical ratios Trigonometrical tables	symbols used in the trades. 8 6. Reading of Plan drawing 12
115 hrs	**Revision /Project work**		
40 hrs	**Examination**		

SYLLABUS – BAREFOOT TECHNICIAN			
SECOND YEAR			
Hours.	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 320 hrs Professional Knowledge 100 hrs	Perform the site survey using prismatic compass.	**Compass survey** • To use of prismatic compass & surveyors compass. • Measuring fore bearing & back bearing of 5-6 side closed polygon. • Conversion of bearing from one system to other. • Measuring fore bearing & back bearing of open traverse. • Measure & Calculate direct angles between successive lines. • Using accessories of plane table. • Locating details by method of radiation	Principle of compass survey, Bearing of lines, Meridian-True meridian, Magnetic meridian and Arbitrary meridian, Bearing –fore bearing, Back bearing, Quadrantal bearing and Reduced bearing system. Conversion of bearing finding included angles from bearing. Prismatic compass component, construction and use. Local attraction Causes, Calculation of included angles. Numerical problem on calculation of bearing angle and local attraction. Traversing- open traverse, Closed traverse, Check in on open and closed traverse, Graphical adjustment for closing error. Numerical problem on closed traverse and open traverse
Professional Skill 160 hrs Professional Knowledge 50 hrs	Perform the site survey using the plane table.	**Plane table** • Locating details with plane table by method of intersection • Locating details with plane table by traverse method • Locating details with plane table by two point problem • Locating details with plane table by three point problem • Plane tabling in combination with chain and compass traversing.	Principle of plane table survey, Uses of plane table survey, Advantage of and Disadvantage of plane table survey, Accessories required and setting out of plane table, Plane table leveling, Centering and orientation, Use of Telescopic Alidade Method of plane table surveying – Radiation method, Intersection method, Traversing method, Resection method two point resection and Merits and Error due to improper

			application, Error of plotting, Allowable error in centering,
Professional Skill 160 hrs Professional Knowledge 50 hrs	Prepare estimate of two room building & Drainage work.	**Estimating of two room building & Drainage work** • Layout plan of sanitary fittings and building drainage, testing of building drainage; • Building water supply: types of water supply fixtures and their applications, layout of building water supply arrangement. • Arrangement of house connection from supply mains; **Electrification:** • Electrification plan of a single storey residential building; Lightening conductor: brief description with necessary sketches; • Fire: causes, fire resisting materials, fire tests, escape means, fire fighting equipments, fire fighting system in a multistoried building, protection; • Earthquake: causes, magnitude for minimizing the effect of earthquake on high rise structures	Introduction to estimating: Types of estimates, drawings to attached with these estimates, preparation of rough cost estimates. Units of measurement and units of payment of different items of work. Different methods of taking out quantities centre line into in/out methods Preparation of a detailed estimate, complete with detailed reports, specifications, abstract of cost and material statement for a small residential; Building with a flat roof. Preparation of a detailed estimate of two room building, complete with detailed reports, specifications, abstract of cost and material statement for pitched roof with steel truss only Building Drainage: Aims of building drainage, different type of sanitary fittings and their applications
Professional Skill 160 hrs Professional Knowledge 50 hrs	Execute methods of safety in construction works.	**Safety in construction works** • Electrical Safety: basics of electrical safety, hazards of electricity on a construction site. • Fire Protection: requirements for proper fire prevention and equipment. • Working emergency action and fire prevention plan. • Tool Safety: use of hand and power tools. Important safety tips associated with Powder-	Principle of safety in construction works. Personal Protective Equipment**:** Protecting Employees, Head Injuries, Eye Protection, Hearing Protection, Foot Protection, Hand and Body Protection Falls in Construction**:** methods of fall protection available to Workers. Protection, Personal Fall Arrest Systems, Guardrails

		Actuated Tools. Basic procedures for safe jack handling. • Materials Handling: Identify, avoid, and control hazardous materials, proper handling, storage, use and disposal.	and Safety Nets, Skylights and Other Openings, Excavations, Roofs.
Professional Skill 160 hrs Professional Knowledge 50 hrs	Perform Dumpy Level survey.	**Dumpy level** • Use of dumpy level, temporary adjustments. • Taking reading on leveling staff, recording in the field book. • Reduction of level by height of instrument method for differential leveling practice. • Reduction of level by rise and fall method for differential leveling practice. • Carrying bench mark from one point to another point about 1000m by height of instrument method. • Carrying bench mark from one point to another point about 800m by rise and fall method.	Definitions : Levelling, Level Surface, Level Line, Horizontal Plane, Vertical Line, Horizontal Line, Datum, Elevation, Vertical Angle, Mean Sea Level, Bench Mark. Methods of Levelling: Levelling instruments: types of instruments to be used in level work, study of component of dumpy level, construction. Levelling staff- telescopic and folding type, fore sight, back sight, intermediate sight, change point, height of collimation, fundamental axes and their relationship, recording in level book, temporary adjustment of dumpy level. Method of reduction level: height of instrument & rise and fall method, arithmetic checks, numerical problems. Classification of levelling: simple, differential, profile, cross-sectional, fly and check levelling. Sources & errors in levelling, precautions & difficulties faced in leveling.
Professional Skill 160 hrs Professional Knowledge 50 hrs	Perform traverse survey by Theodolite & prepare a site map.	**Theodolite survey** • Understanding the component of Theodolite & draw neat sketch of the components. • To study function of Theodolite, reading of Vernier scale. • To study temporary	Introduction: components of transit Theodolite & their functions, technical terms used. Temporary adjustments of transit Theodolite. Surveying the telescope, transiting, changing the face left & right. Measurement of horizontal

		adjustments of Theodolite and measurement of horizontal angle by Theodolite • To measurement of horizontal angle by method of repetition • To measurement of vertical angle by Theodolite • To measurement of deflection angle by taking open traverse of 4-5 sides.	angle by general procedure & repetition method. Measure magnetic bearing of a line, measure direct angle, deflection angle, prolong a straight line. Measurement of horizontal angle & horizontal angle by Theodolite. To lay off an angle by repetition, fundamental lines & desired relations. Calculations of bearing from angles, traverse computation, latitude, departure, consecutive co-ordinates error.
Professional Skill 160 hrs Professional Knowledge 50 hrs	Prepare estimate of 1KM road & culvert.	**Estimating of 1KM road & culvert** • Preparation of detailed estimate using the above quantities of one km roads. • Culvert: definitions of culvert, types of culvert. • Pipe culvert, slab culvert, hume pipe culvert, rcc slab culvert, box culvert. • Detailed estimate of a box culvert span upto 6m. • Detailed estimate of a hume pipe culvert upto 6m. • Detailed estimate of a single span slab culvert upto 10m.	Roads**:** Methods for calculating earth work using: i) Average depth ii) Average cross sectional area iii) Graphical method Calculations of quantities of materials for roads in plains for one kilometer roads.
Professional Skill 192 hrs Professional Knowledge 60 hrs	Execute complete finishing of building and establish Building services.	**Building finishes and services** • Pointing – Necessity and procedure of pointing. Painting – Necessity, Surface preparation, method of application, selecting suitable painting material, white wash and color wash. • Building services: definitions, types building services, building management system, energy generation, distribution and supply, escalators and lifts, fire	Introduction: definition of building finishes, type of building finishes. Plastering, pointing, painting, varnishing, distempering, white washing, color washing. Floor finishes materials: kota, marble, granite, Kadappa, Ceramic tiles, vitrified, mosaic tiles, chequerred tiles, glazed tiles, pavement blocks, concrete floors, tremix floor, skirting and dado.

		sefty, detection and protection, heating, ventilation and air conditioning. • Information and communication technology network, lighting, lighting protection, refrigeration, security and alarm system. Water system, drainage and pumping.	Process of lying- Process of laying and construction, finishing and polishing of floors. Roofing materials – AC sheets, G.I. sheets, plastic sheets, fibre sheets, Mangalore tiles etc. Steel trusses. R.C.C. SLAB Wall finishes: Plastering – Necessity of plastering, Single coat plaster. Double coat plaster, plaster board and wall claddings. Precaution to be taken while plastering. Defects in plaster.
Professional Knowledge WSC: 40 hrs	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**Workshop Calculation & Science** **Area of cut out regular surfaces and area of irregular surfaces** Area of cut out regular surfaces - circle, segment and sector of circle Related problems of area of cut out regular surfaces - circle, segment and sector of circle Area of irregular surfaces and application related to shop problems **Algebra** Algebra - Addition , subtraction, multiplication & division Algebra - Theory of indices, algebraic formula, related problems **Profit and Loss** Profit and loss - Simple problems on profit & loss **Estimation and Costing** Estimation and costing - Simple estimation of the requirement of material etc., as applicable to the trade Estimation and costing - Problems on estimation and costing	
115 hrs	**Revision/ Project work**		
40 hrs	**Examination**		

9. SYLLABUS - CORE SKILLS

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all trades) (120 Hrs + 60 Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for all trades, provided separately in www.bharatskills.gov.in

ANNEXURE-I

LIST OF TOOLS & EQUIPMENT		
Barefoot Technician (Flexi MoU) **(For batch of 20 candidates)**		
S No.	**TOOLS, EQUIPMENT, MACHINERIES AND VEHICLES**	**QTY**
1.	Engineering Instrument Box	21 Nos.
2.	Protractor 15 cm full circular	21 Nos.
3.	Card board/ plastic metric scale set- A to H	21 Nos.
4.	Diagonal scale, electroplated	21 Nos.
5.	Celluloid set square 45˚ & 60˚	21 Nos.
6.	T square 1250 mm/ Mini drafter	21 Nos.
7.	Erasing shield small size	21 Nos.
8.	Architect's & builder's template	21 Nos.
9.	Chisel- steel 80 mm blade	21 Nos.
10.	French curve- set of 12	01 set
11.	Abney level	08 Nos.
12.	Ammonia printing machine with box	08 Nos.
13.	Box sextant	08 Nos.
14.	Boning rod	08 Nos.
15.	Binocular	05 Nos.
16.	Chalk board/White board	03 Nos.
17.	Cupboard (Big)	21 Nos.
18.	Ceylon ghat tracer with stand & target	21 Nos.
19.	Scientific calculator	21 Nos.
20.	Computing scales two hectares	21 Nos.
21.	Computing scales five hectares	21 Nos.
22.	Wooden cross staff- box type	21 Nos.
23.	Wooden cross staff- open type	08 Nos.
24.	Drawing Board 1250mmx900mm with stand	21 Nos.
25.	Engineer's chain	08 Nos.
26.	Engineer's level	08 Nos.
27.	Dumpy level	08 Nos.
28.	Hold all canvas for instruments	08 Nos.
29.	Leveling staff - telescopic type	08 Nos.

30.	Auto level	08 Nos.
31.	Tilting level	08 Nos.
32.	Fire extinguisher	08 Nos.
33.	Gunter's chain	08 Nos.
34.	Hand press for numbering & lettering	21 Nos.
35.	Canvas bag	21 Nos.
36.	Height indicators	21 Nos.
37.	Metric chain- 30 m & 20 m 5 each	21 Nos.
38.	Magnifying glass	21 Nos.
39.	Magnet bar (for magnetizing through compass needles)	21 Nos.
40.	Plastic tubes for keeping drawings	21 Nos.
41.	Pen knife	21 Nos.
42.	Pentograph	21 Nos.
43.	Prismatic compass	08 Nos.
44.	Planimeter (digital)	08 Nos.
45.	Proportionate compass	08 Nos.
46.	Ranging rod 4 m	08 Nos.
47.	Indian pattern clinometers	08 Nos.
48.	Offset rod	08 Nos.
49.	Optical square	08 Nos.
50.	Railway curves-Set of 50 in a box	08 Nos.
51.	Telescopic alidade	08 Nos.
52.	Plane table with stand , accessories & water proofing cover	08 Nos.
53.	Survey plotting scale-8 scales with offset scale in box	08 Nos.
54.	Stencil set	08 Nos.
55.	Substance bar	08 Nos.
56.	Metallic tape 30 m	08 Nos.
57.	Metallic tape 20 m	08 Nos.
58.	Steel tape 30 m	08 Nos.
59.	Steel band 30 m & 20 m	08 Nos.
60.	Surveyor's umbrella	05 Nos.
61.	Theodolite transit	03 Nos.
62.	Digital Theodolite	03 Nos.
63.	Rules ebonite plain for drawing lines	03 Nos.
64.	Wooden set square, T square & Compass in a box	21 Nos.
65.	Total station –Leica	02 Nos.
66.	Hand GPS-latest version	02 Nos.
67.	Drawing sheet-A1 size	21 Nos.
68.	Field book as required for the survey work	21 Nos.
69.	Tracing paper roll	21 Nos.
70.	Drawing pencil-HB, 2H, H, etc.	21 Nos.

71.	Eraser	21 Nos.
72.	Adhesive tape	08 Nos.
73.	Drawing pen/ Rotring pen	21 Nos.
74.	Color pencil	21 Nos.

Tools & Equipment for Employability Skills		
S No.	**Name of the Equipment**	**Quantity**
1	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	20 no.
2	UPS - 500VA	20 no.
3	Scanner cum Printer	1 no.
4	Computer Tables	20 no.
5	Computer Chairs	20 no.
6	LCD Projector – One in each class room	One in each class room
7	White Board 1200mm x 900mm	One in each class room

ANNEXURE-II

K.K. Techno Solution Pvt. Ltd. Training Center

Trainee Internal Assessment Report

Name :		**Batch No:**	
Card ID No :		**Dept:**	
Attendance % :			

Quarters	Month	Attend %	Month	Attend %	Month	Attend %	Quarterly Average Attend. %
Qtr-1							
Qtr-2							
Qtr-3							
Qtr-4							

General Assessment **Assessment Period :**

S.No	ATTRIBUTES		Score Qtr-1	Score Qtr-2	Score Qtr-3	Score Qtr-4	Score Sum of 4-Qtrs
1	**Safety**	Knowledge, follow safety precautions and rules					
2	**Sense of Responsibility**	Does he obey Sup/Line i/c instructions					
		Does he attend shift start meetings regularly					
		Does he take supervisors feedback properly					
		Whether he takes planned leaves					
		Does he participates in new drives					
		Does he take care in handling tools					
		Is Punctual					
		Positive, Behaviour, response, learning					
		Maintain 5S at his work station					
		Co-operation - Consider team work, willingness to work with and for others					
		Able to identify and report irregularities at his work place					
3	**Method**	Follow WIS/MOS					
		Able to check faults of previous station					
		Understands tools/equipment functions and its different parts					
		Able to perform the job independently					
4	**Speed**	Able to match line "TACT" time					
		Willingness to learn/flexibility for alternate job					
		Work completion/target achievement					
5	**Quality**	Able to contain defects					
		Awareness about GCA/PDI					
		Skill acquired during "On job training"					
		Total Score					
		Max. Marks					

Fill score in relevant box	**Exellent:4**	**Very Good:3**	**Good:2**	**Fair:1**
			Need Improvement:0	
Remark of Supervisor: Mention Achievement				
Remark of Shift In charge/Dept, Mgr.				
Remark of NISP Training In charge				
Any Remark				