# MECHANIC DAIRY MAINTENANCE

## COMPETENCY BASED CURRICULUM

**(Duration: 2 Yrs.)**

## APPRENTICESHIP TRAINING SCHEME (ATS)

**NSQF LEVEL- 5**



## SECTOR – AGRICULTURE AND ALLIED SERVICES

सत्यमेव जयते

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

Directorate General of Training

Skill India
कौशल भारत-कुशल भारत

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**(Revised in 2018)**

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**NSQF LEVEL - 5**



Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
**CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE**
EN-81, Sector-V, Salt Lake City,
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Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

| Sl. No. | Name & Designation Sh./Mr./Ms. | Organization | Expert Group Designation |
|---|---|---|---|
| 1. | Ashok Bansal, DGM (T) | Delhi Milk Scheme, New Delhi - 8 | Chairman |
| 2. | S K Gupta, DDT | RDAT, Faridabad | Secretary |
| 3. | S S Bansal, Dy. Manager | Mother Dairy, Delhi | Member |
| 4. | S K Aggarwal, Sr. Plant Officer | Mother Dairy, Delhi | Member |
| 5. | M I Akhtar, Dairy Engineer | Delhi Milk Scheme, New Delhi - 8 | Member |
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## CONTENTS

# 1. BACKGROUND

## 1.1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate (ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

## 1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

## 1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

# 2. TRAINING SYSTEM

## 2.1 GENERAL

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

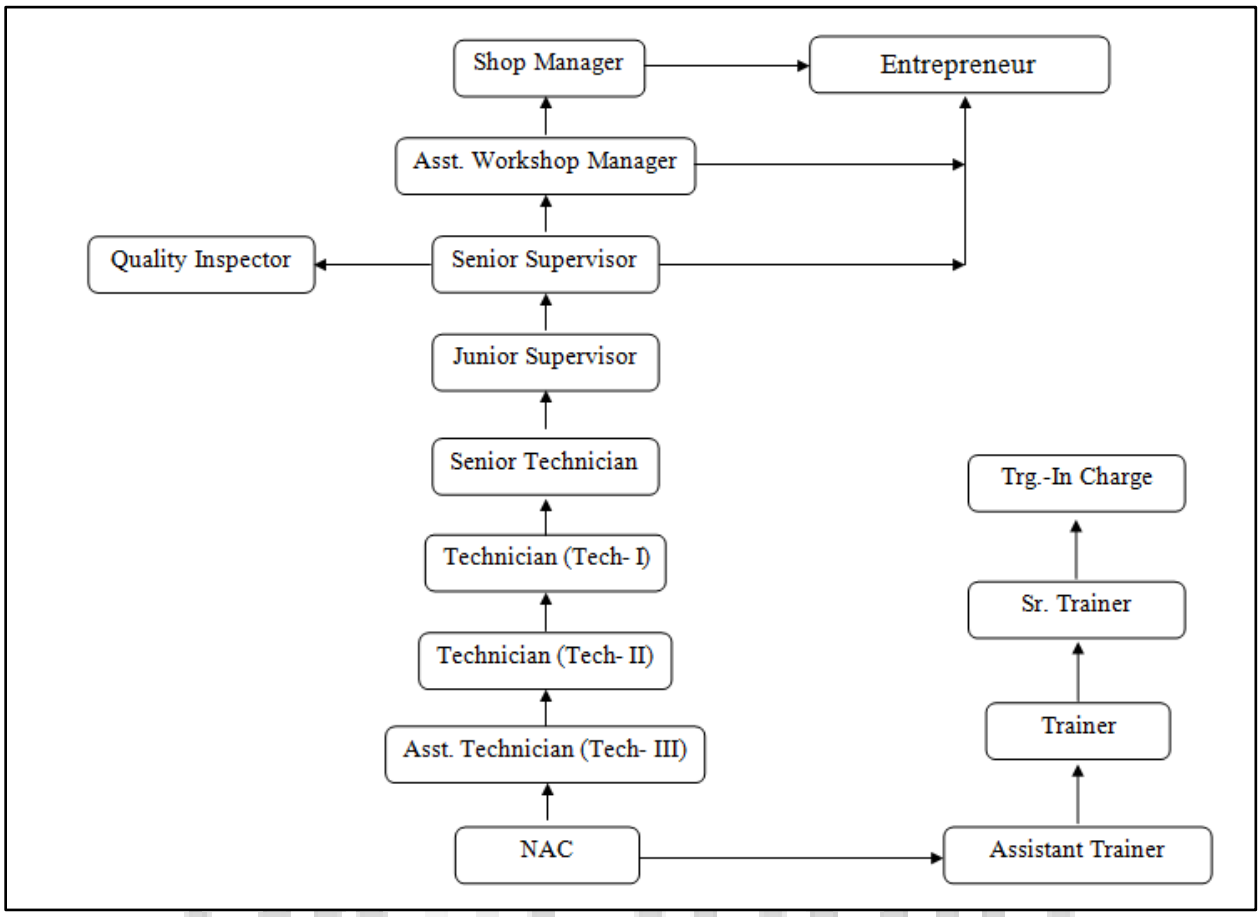
Mechanic Dairy Maintenance trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

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

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

## 2.2 CAREER PROGRESSION PATHWAYS:

- Indicative pathways for vertical mobility.




## 2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*): -

**Total training duration details: -**

| Time (in months) | 1-3 | 4-12 | 13-15 | 16-24 |
|---|---|---|---|---|
| **Basic Training** | **Block– I** | **-----** | **Block – II** | **------** |
| **Practical Training (On - job training)** | **----** | **Block – I** | **------** | **Block – II** |

**A. Basic Training**

For 02 yrs. Course (Engg) :-( **Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)

For 01 yr. course (Engg) :-( **Total 03 months:** 03 months in 1st yr.)

| S No. | Course Element | Total Notional Training Hours | |
|---|---|---|---|
| | | **For 02 Yrs. course** | **For 01 Yr. course** |
| 1. | Professional Skill (Trade Practical) | 550 | 275 |
| 2. | Professional Knowledge (Trade Theory) | 240 | 120 |
| 3. | Workshop Calculation & Science | 40 | 20 |
| 4. | Engineering Drawing | 60 | 30 |
| 5. | Employability Skills | 110 | 55 |
| | **Total (Including internal assessment)** | **1000** | **500** |

**B. On-Job Training:-**

For 02 yrs. Course (Engg) :-( **Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg) :-( **Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

**C. Total training hours:-**

| Duration | Basic Training | On-Job Training | Total |
|---|---|---|---|
| **For 02 yrs. course** (Engg) | 1000 hrs. | 3120 hrs. | 4120 hrs. |
| **For 01 yr. course** (Engg) | 500 hrs. | 2080 hrs. | 2580 hrs. |

## 2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

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

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

## 2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

## 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 assessment. Due consideration should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

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



Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by 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 with occasional guidance and showing due regard for safety procedures and practices, | • Demonstration of good skill in the use of hand tools, machine tools and workshop equipment |

| | |
|---|---|
| has produced work which demonstrates attainment of an acceptable standard of craftsmanship. | • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards.<br>• A fairly good level of neatness and consistency in the finish<br>• Occasional support in completing the project/job. |
| (b) Weightage in the range of above75% - 90% to be allotted during assessment | |
| For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship. | • Good skill levels in the use of hand tools, machine tools and workshop equipment<br>• 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards.<br>• A good level of neatness and consistency in the finish<br>• Little support in completing the project/job |
| (c) Weightage in the range of above 90% to be allotted during assessment | |
| For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship. | • High skill levels in the use of hand tools, machine tools and workshop equipment<br>• Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards.<br>• A high level of neatness and consistency in the finish.<br>• Minimal or no support in completing the project. |

# 3. JOB ROLE

**Brief description of Job roles:**

**Mechanic, Dairy Maintenance** repairs and services dairy equipment to maintain them in working condition. Repairs and services bottle and can-washers, soakers, butter and cheese packing and sealing equipment, pasteurizers milk evaporators, etc. replaces defective wiring, burnt fuses, worn switches and connects electric motors. Repairs and installs pumps, fits water and gas pipes and repairs leaky joints by general fitting operation, using hand tools or by simple welding, as necessary. May clean and re-assemble refrigeration units, regulate boiler supply pressure and mend leaky steam pipes and joints by simple welding.

**Reference NCO-2015:** 7233.1400 - Mechanic, Dairy Maintenance

# 4. NSQF LEVEL COMPLIANCE

NSQF level for Mechanic Dairy Maintenance trade under ATS: **Level 5**

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 and
e. Responsibility.

The Broad Learning outcome of Mechanic Dairy Maintenance trade under ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

| Level | Process Required | Professional Knowledge | Professional Skill | Core Skill | Responsibility |
|---|---|---|---|---|---|
| Level 5 | Job that requires well developed skill, with clear choice of procedures in familiar context. | Knowledge of facts, principles, processes and general concepts, in a field of work or study | A range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information. | Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication. | Responsibility for own work and Learning and some responsibility for other's works and learning. |

# 5. GENERAL INFORMATION

| | |
|---|---|
| **Name of the Trade** | MECHANIC DAIRY MAINTENANCE |
| **NCO - 2015** | 7233.1400 Mechanic, Dairy Maintenance |
| **NSQF Level** | Level – 5 |
| **Duration of Apprenticeship Training** (Basic Training + On-Job Training) | Two years (02 Blocks each of one year duration). |
| **Duration of Basic Training** | a) Block –I : 3 months<br>b) Block – II : 3 months<br>**Total duration of Basic Training: 6 months** |
| **Duration of On-Job Training** | a) Block– I: 9 months<br>b) Block–II : 9 months<br>**Total duration of Practical Training: 18 months** |
| **Entry Qualification** | Passed 10th class examination under 10+2 system of education with Science and Mathematics or its equivalent. |
| **Selection of Apprenticeship** | The apprentices will be selected as per Apprenticeship Act amended time to time. |
| **Instructors Qualification for Basic Training** | As per ITI instructors qualifications as amended time to time for the specific trade. |
| **Infrastructure for Basic Training** | As per related Trade of ITI |
| **Examination** | The internal examination/ assessment will be held on completion of each block.<br>Final examination for all subjects will be held at the end of course and same will be conducted by NCVT. |
| **Rebate to Ex-ITI Trainees** | 01 year |
| **CTS trades eligible for Mechanic Dairy Maintenance Apprenticeship** | i) Fitter<br>ii) Tool & Die Maker<br>iii) Refrigeration and Air-conditioning Mechanic |

***Note:***

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

## 6. LEARNING OUTCOME

## 6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/Generic Learning Outcome after completion of the Mechanic Dairy Maintenance course of 02 years duration under ATS.

**Block I & II:**

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Understand and explain different mathematical calculation & science in the field of study. *[Different mathematical calculation & science – Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight, Density, Specific Gravity etc.].*
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Mechanic Dairy Maintenance / Wireman / Electrician/ trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems, Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.].*
4. Select and ascertain measuring instrument and measure dimension of components and record data.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Plan and organize the work related to the occupation.



## 6.2 SPECIFIC LEARNING OUTCOME

**Block – I**

1. **Pipe Work**
    - Flare small copper pipes/ SS pipes and their jointing.
    - Thread cutting on pipes hand and lathe.
    - Pipe jointing with fitting.
    - Lay steamed water and gas pipes.
    - Lagg steam and refrigeration pipe.

2. **Electrical Wiring and repair**
    - Skin cable insulation and jointing.

- Wiring of switches, wall sockets, fuse blocks, etc.
- Wiring circuits in series and parallel.
- Use of current measuring instruments.
- Use of electric meter.
- Test polarity in circuit.
- Connect domestic appliances in use in the dairy industry.
- Connect electric motors.
- Study of pesto flash and Air circulation and their maintenance.

3. **Welding**
    - Prepare job for various types of welds.
    - Gas welding uses of different sized nozzle and flame adjustment.
    - Gas cutting.
    - Butt and lap welding use proper filler rods.
    - Vertical, horizontal and overhead welding.
    - Welding of inside and outside corner joints.
    - Welding of steel cast iron and SS steel.
    - Argon arc welding.
4. **Steam Boiler**
    - Basic knowledge of various boiler mounting.
    - Basic knowledge of various boiler auxiliaries.
    - General idea of cleaning and preparation of boiler for inspection.
    - General idea of stoking and adjustment of draught for proper steam pressure.
5. **Refrigeration**
    - Clean and assemble refrigerator components.
    - Leak detection and rectification.
    - Changing of control.
    - Surge on condensable gases and draining of oil.
    - Operation of deep freezing machine.
    - Operation of ice-cream freezers-batch and continuous types.
    - Control of oven and refrigeration.
    - Service refrigeration machines.

**Block – II**

6. **Pumps**
    - Working knowledge of Air Conditioners.
    - Working knowledge of Centrifugals and homogenizers, and centrifugal pumps.
7. **Packaging**
    - Operate service and maintain feeding and package equipments.
    - Service and maintain of conveying and washing/ sterilizing equipments.
8. **General Plant work**
    - Operate and maintain cream separators, HTS, Pasteurizers, UHT clarifiers.

- Maintenance of Butter churns (batch & continuous) cheese vats press and mills.
- Operate and maintain milk evaporators, vacuum pump.
- Disassembling, assembling, operation and maintenance of spray drying plant and its components.
- Repair packing and sealing equipment used in the dairy i.e. butter packing, cheese packing sealing and tin sealing automatic and semi-automatic.
- General maintenance of the plant and examination.
- Study and maintenance if energy conserving devices use for dairy maintenance.

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

# 7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

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

| | | |
|---|---|---|
| calculation & science in the field of study. *[Different mathematical calculation & science – Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight, Density, Specific Gravity etc.].* | | speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction. |
| | 2.2 | Measure dimensions as per drawing. |
| | 2.3 | Use scale/ tapes to measure for fitting to specification. |
| | 2.4 | Comply with given tolerance. |
| | 2.5 | Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials. |
| | 2.6 | Ensure dimensional accuracy of assembly by using different instruments/gauges. |
| | 2.7 | Explain basic electricity, insulation & earthing, Different types of flow, viscosity, Reynolds's number. |
| | | |
| 3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Mechanic Dairy Maintenance / Wireman / Electrician/ trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems, Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.].* | 3.1 | Read & interpret the information on drawings and apply in executing practical work. |
| | 3.2 | Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters. |
| | 3.3 | Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work. |
| | 3.4 | Read & interpret the signs and symbols for electrical components and AC/DC systems. |
| | 3.5 | Encounter drawings with electrical circuit diagrams and layout diagrams. |
| | | |
| 4. Select and ascertain measuring instrument and measure dimension of components and record data. | 4.1 | Select appropriate measuring instruments such as Ammeter, voltmeter, meggar, earth tester etc. (as per tool list). |
| | 4.2 | Ascertain the functionality & correctness of the instrument. |

| | |
|---|---|
| | 4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement. |
| | |
| 5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality. | 5.1 Explain the concept of productivity and quality tools and apply during execution of job. |
| | 5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws. |
| | 5.3 Knows benefits guaranteed under various acts. |
| | |
| 6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources. | 6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution. |
| | 6.2 Dispose waste following standard procedure. |
| | |
| 7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth. | 7.1 Explain personnel finance and entrepreneurship. |
| | 7.2 Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme. |
| | 7.3 Prepare Project report to become an entrepreneur for submission to financial institutions. |
| | |
| 8. Plan and organize the work related to the occupation. | 8.1 Use documents, drawings and recognize hazards in the work site. |
| | 8.2 Plan workplace/ assembly location with due consideration to operational stipulation |
| | 8.3 Communicate effectively with others and plan project tasks |
| | 8.4 Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same. |
| **SPECIFIC OUTCOME** | |
| **Block-I & II (Section:10 in the competency based curriculum)** | |
| *Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II** (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic* | |

*methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and* ***Checking / Testing*** *to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*

## BASIC TRAINING (Block – I)

**Duration: (03) Three Months**

| Week No. | Professional Skills (Trade Practical) | Professional Knowledge (Trade Theory) |
|---|---|---|
| 1 | Familiarization with dairy industry, importance of trade training machinery used in the trade, type of work done by trainees in the dairy, type of jobs made by the trainees in the trade. Introduction to safety including fire fighting equipment & their uses etc. | Importance of safety and general precautions observed in the industry. Importance of the trade in the development of industrial economy of country recreational and medical facilities and other extracurricular activities of the institute. |
| 2 | Perform chipping, grinding of chisels, sawing, drilling and tapping<br>Carry out Threading with dies, use micrometers, vernier- linear and angular.<br>Carry out scrapping of bearings, sharpening of scrapers, remaining, fitting and removal of studs.<br>Perform fitting of mating parts, assemble machine parts and cutting keyways and fitting keys, simple forging of cold chisels, hardening and tempering of chisels, soldering and marking out on sheet metal.<br>Perform simple riveting and repair work. | Study of Measuring instruments like micrometers, vernier-callipers.<br><br>Study the process of chipping, grinding of chisels, sawing, drilling and tapping. Specification and description of scrapping of bearings, sharpening of scrapers, remaining, fitting and removal of studs. Various machine parts, heat treatment on sheet metal.<br><br>General Care and maintenance measures. |
| 3-4 | Use of various types of valves.<br>Use of various types of gaskets.<br>Use of various type of pipes.<br>Joints for various pipes.<br>Assemble fittings, valves, bowls, strainers and other parts of equipment to prepare for production. | Introduction to various types of valves.<br>Introduction to various types of gaskets.<br>Introduction to various types of pipes.<br>Different types of joints for pipe fittings. |
| 5-6 | **Pipe Work**<br>• Identify steam pipe, G.I. pipes, Stainless steel pipes, Aluminium pipes, Copper tubing's and their fittings.<br>• Perform Different operations of the lathe like taper, turning, thread cutting on shaft, grinding of tool bit. | **Pipes and Fittings**<br>Specification and description (English and Metric), threaded pipes and their nomenclature, jointing material and standards, hydraulic and gas pipes. Copper and stainless steel pipes and their fittings. Packing and gaskets. Pipe jointing, sanitary fittings. |

| | | |
|---|---|---|
| | • Perform Pipe jointing with fittings, laying of steam pipes, their lagging, types of anchors and expansion joints.<br>• Lay water supply and gas pipes. | |
| 7-8 | **Electric Wiring and Repair**<br>• Perform Skinning of wire insulation and jointing.<br>• Identify Switches, Wall sockets, fuse blocks, measuring instruments.<br>• Identify Series and parallel circuits, Electrical fittings and common circuits.<br>• Identify Electric meters.<br>• Test polarity in circuits.<br>• Connect domestic appliances used in daily industry.<br>• Connect electric motors.<br>• Measure current in the circuits, use of meggers.<br>• Perform General maintenance and cleaning of Electrical Installation like starter, MCE, ACB, Relays, lighting etc. | **Electricity**<br>Signs and symbols used ion electricity. Calculating area and size of conductors. Electricity as applied to various equipments used in the industry. Calculation of work, power and energy. Ohm's Law and its application problems relating to calculation of total current and resistances in various circuits ammeter. Megger description and use, problems on series and parallel circuits. Principles of working various types of AC motors. General idea – single and three phase power supply, star and delta connections, power factor different types of ACB/MCB – related to dairy equipments. |
| 9-10 | **Welding (Gas and Electric)**<br>• Identify Oxy-acetylene welding flames and their adjustment.<br>• Perform Gas cutting and Brazing.<br>• Perform Butt and lap welding use of proper filler rods.<br>• Carry out Inside and outside corner joints.<br>• Carry out Vertical, horizontal and overhead welding.<br>• Perform Arc welding on D.C. and A.C. adjustment of current.<br>• Carry out Running a bead, maintaining speed of welding.<br>• Prepare job for welding.<br>• Perform Welding of steel, G.I. and stainless steel.<br>• Carry out Die penetration test. | **Welding (Gas and Electric)**<br>Gas welding equipment, sizes of nozzles. Pressure regulators, types of welds and their preparation, brazing and its techniques gas cutting, safety precaution. Principles of arc welding, selection of electrodes, current adjustment. Preparation of welds. AC and DC generators used for arc welding. Principles of argon arc welding, safety precautions. |
| 11-12 | **Steam Boilers** | **Boiler and Steam Generation** |

| | | |
|---|---|---|
| | • Identify suitability for boiler and other dairy needs. Identify zeolite water softeners.<br>• Identify Boiler in details for its safe operation.<br>• Perform Stoking, adjustment of draught, maintaining supply pressure, shutting and cleaning of boilers.<br>• Preparation of boilers for inspection.<br>• Working of fire tube boilers, water tube boilers, oil fired and packaged boilers. | Stages for steam generation, boiler fuels, principle and operation boilers. Mounting and their functions. Water and smoke tube boiler. Automatic fuel feeds, nozzles for the oil fired and packaged. Efficiency of boilers, smoke analysis of boilers. |
| 13 | **Assessment/Examination 03days** | |

**Note: -** *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

## BASIC TRAINING (Block – II)

**Duration: (03) Three Months**

| Week No. | Professional Skills (Trade Practical) | Professional Knowledge (Trade Theory) |
|---|---|---|
| 1-3 | **Refrigeration**<br>• Carry out Cleaning assembling of refrigerator components.<br>• Identify Leak detection and rectification.<br>• Change control, surging on condensable gases and draining of oil.<br>• Operate refrigeration machines – deep freezing ice-cream freezer, batch and continuous types, sharpening of blades, control of overrun and refrigeration.<br>• Perform Service of refrigeration of machines and liquid nitrogen equipment. | **Refrigeration and Refrigerators**<br>Principles of refrigeration, temperature-pressure relationship of refrigeration cycle. Function of refrigerator accessories. Expansion valves, evaporators, and condensers. Leak detectors and oil separators, common tools and equipments. Air compressors their working and repair, refrigerants. Types, consideration upon their choice, refrigerants control. Glycol system of deep chilling of Milk. Study of shell and tube type condensers. |
| 4-5 | **Pumps**<br>• Operate, Service and maintain water pumps, milk pumps, C.I.P pumps, submersible pumps, turbine pump, Multistage Centrifugal pumps, gear pumps. | **Pumps**<br>Submersible turbine, multistage centrifugal, gear rotory and reciprocatory pumps. Principles of working, comparison of performance and selection of pumps. Power requirements. |
| 6-8 | **Packaging**<br>• Carry out Liquid Milk Bottling, pouch, filling and tetra pack.<br>• Prepare Milk Products like Butter, Cheese, Ghee, Ice-cream etc.<br>• Operate, Service and maintain feeding, packaging and covering of machines including washing/ sterilising equipment.<br>• Identify FFS (form fill and seal) type of packing machine for milk, Ghee and yoghurt, cup forming, filling and sealing machine, Bulk vending machine, Knowledge of specification of thickness and color of polyfilm used for packing. | **Separation**<br>Centrifugal separation, principles. Difference between separators and clarifiers. |

| | | |
|---|---|---|
| 9-12 | **In-place Cleaning**<br>• Operate, Service and maintain tanks, valves pump sets, programmer/control panel, etc.<br>• Use of detergents, setting of time etc. | **Washing**<br>Sequence of washing operation their significance and detergents used. |
| | **General Plant Work**<br>• Operate and maintain cream separators, homogenizers, plate heat exchangers (pasteurizers and chillers).<br>• Maintain Butter churns (batch & continuous) cheese vats press and mills.<br>• Operate and maintain milk evaporators, vacuum pump.<br>• Disassemble, assemble, operate and maintain spray drying plant and its components.<br>• Repair packing and sealing equipment used in the dairy i.e. butter packing, cheese packing sealing and tin sealing automatic and semi-automatic.<br>• Identify, repair and maintenance of Air drier and Air Compressors-screw/ reciprocating type, heatless air dryer.<br>• Carry out General maintenance of the plant and examination including replacement of bearing.<br>• Identify, repair and maintenance of road milk, tanker, milk storage tank, silos.<br>• Identify different type of affluent treatments. | **Pasteurization**<br>Definition – regeneration, efficiency and comparison.<br>Bottle filler and capper – selection thereof.<br>Butter and cheese – making – various steps involved, butter churns.<br>Ice-cream making – stages involved – comparison between continuous and batch processes.<br>Evaporation – elementary principles of evaporation. Common faults and remedies.<br>Roller – drying and spray drying - elementary principles of evaporation. Common faults and remedies.<br>Preventive maintenance – importance of regular servicing. Preparation of maintenance schedule and maintenance logs, cards, use of reference table and hand books, bearing and lubricants.<br>Modern developments in the trade – new techniques etc.<br>Quality and finish of jobs – importance of quality and finish of jobs at all stages – protection of finished surface.<br>Introduction of work simplification – job study, job analysis including planning of sequence of operations. Critical approach and method of working. Estimation of time and material.<br>Modern development and new techniques and study of head books. |
| 13 | **Assessment/Examination 03 days** | |

**Note: -** *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

## 9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

| Block – I | | |
|---|---|---|
| **Sl. No.** | **Workshop Calculation and Science (Duration: - 20 hrs.)** | **Engineering Drawing (Duration: - 30 hrs.)** |
| 1. | **Algebra –** simple equations and transpositions, problems, standard algebraic formulae, e.g. $(a + b)^2$, $(a - b)^2$ etc. simple simultaneous equations with two unknown quantities. | Projection of straight lines in various positions of squares, rectangles, circles and polygons. Projection of solid and hollow objects such as cones, prisms, pyramids etc. |
| 2. | **Mensuration** – area of circle and ellipse. Volume and weight of regular cones and spheres. Calculation of areas, volume and weight of simple solid bodies – applied problems.<br>Advance problems on mensuration. | Development of surfaces from simple objects.<br>Construction of isometric scale. |
| 3. | Further problems of application to the trade – calculation of speed and feed. Calculation for the preparation of estimate of cost. Time and material for various type of repair. | Drawing of riveted joints, different types of threads, bolts, nuts and locking devices, keys, cotters, different types of couplings, bearings, pulleys, gears etc. |
| 4. | Meaning of stress, strain modulus of elasticity, ultimate tensile strength, factor of safety and different types of stresses.<br>Meaning of tenacity, elasticity, malleability, brittleness, hardness, compressibility and ductility. | Free-hand sketching and production of working drawing of actual machines, parts or engine parts as applicable to the trade.<br>Free-hand sketching of detailed components from assembling. |
| 5. | Gear, belt and rope drives. Determination of horse power speed and size of pulley and gears.<br>Determination of force on the piston, ram etc. | Sketching of pipe fittings, drawing of pipe layouts, conventions. |
| 6. | Velocity and acceleration. 'Centre of gravity and specific gravity'.<br>Elementary principles of parallelogram and triangle of forces. Application to lifting tackles.<br>Mechanical advantage – velocity ratio useful work, mechanical efficiency of a machine. | Sketching of gas welding. Equipments, conventions for welded joints,. Simple sketching of welding joints. |

| Block – II | | |
|---|---|---|
| **Sl. No.** | **Workshop Calculation and Science (Duration: - 20 hrs.)** | **Engineering Drawing (Duration: - 30 hrs.)** |
| 1. | Work and energy their units friction, simple problems, on straight and bell crank levers. | Sketching of boiler, its accessories and mountings. |
| 2. | Description explanation of expansion of solids, liquids and gases due to heat-co-efficient of expansion. Brief description of transference of heat conduction, convection and radiation.<br>Simple calculation on the conversion and mechanical energy. | Line sketch for pipe lines on the high and low pressure side of refrigeration units, connection used in refrigeration.<br>Free-hand sketching of various pumps' parts. |
| 3. | Estimation of steam, water, gas and milk pipe requirement for particular spaces and discharge of fluids and vapour.<br>Calculation of cast of steam production. | Sketching of cans used in the can washer. |
| 4. | Magnet nature and artificial poles of magnet lines of force magnetic field earth magnetism. | Sketching of flow diagram for pasteurization. |
| 5. | Electricity and its various electric current positive and negative terminals. Signs and symbols in electricity use of switches and fuses. Units of current resistance and voltage, conductors and insulators. Units of power, watt and kilowatt relationship with horse-power. Board of trade units, problems of calculation, the resistance of conductor, calculation of work, power and energy. Ohm's Law and its application. Problems relating to the calculation of total current and resistance in various circuits Ammeter and megger etc. Description and use. Problems on series and parallel circuits. Principles of working of various types of AC and DC motors.<br>Specification for the capacity of refrigeration. B.TH.U. and C.H.U. valves for milk and milk products. | Sketching of different evaporators. |
| 6. | Pumps horse-power calculation, heads and discharge. | Advance Blue-Print reading. Drawing of lubrication and cooling systems. |
| 7. | Calculation of safe working load. | Code of practice for General Engineering Drawing according to ISI (IS:696-1960). |

## 9.2 EMPLOYABILITY SKILLS

**(DURATION: - 110 HRS.)**

| **Block – I (Duration – 55 hrs.)** | |
|---|---|
| **1. English Literacy** | Duration : 20 Hrs.<br>Marks : 09 |
| **Pronunciation** | Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech) |
| **Functional Grammar** | Transformation of sentences, Voice change, Change of tense, Spellings. |
| **Reading** | Reading and understanding simple sentences about self, work and environment |
| **Writing** | Construction of simple sentences Writing simple English |
| **Speaking / Spoken English** | Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication. |
| **2. I.T. Literacy** | Duration : 20 Hrs.<br>Marks : 09 |
| **Basics of Computer** | Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer. |
| **Computer Operating System** | Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications. |
| **Word processing and Worksheet** | Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document.<br>Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets. |
| **Computer** | Basic of computer Networks (using real life examples), Definitions of |

| | |
|---|---|
| **Networking and Internet** | Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks),<br>Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication.<br>Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes. |
| **3. Communication Skills** | Duration : 15 Hrs.<br>Marks : 07 |
| **Introduction to Communication Skills** | Communication and its importance<br>Principles of Effective communication<br>Types of communication - verbal, non verbal, written, email, talking on phone.<br>Non verbal communication -characteristics, components-Para-language<br>Body language<br>Barriers to communication and dealing with barriers.<br>Handling nervousness/ discomfort. |
| **Listening Skills** | Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.<br>Triple- A Listening - Attitude, Attention & Adjustment.<br>Active Listening Skills. |
| **Motivational Training** | Characteristics Essential to Achieving Success.<br>The Power of Positive Attitude.<br>Self awareness<br>Importance of Commitment<br>Ethics and Values<br>Ways to Motivate Oneself<br>Personal Goal setting and Employability Planning. |
| **Facing Interviews** | Manners, Etiquettes, Dress code for an interview<br>Do's & Don'ts for an interview. |
| **Behavioral Skills** | Problem Solving<br>Confidence Building<br>Attitude |
| **Block – II<br>Duration – 55 hrs.** | |
| **4. Entrepreneurship Skills** | Duration : 15 Hrs.<br>Marks : 06 |
| **Concept of** | Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue |

| | |
|---|---|
| **Entrepreneurship** | Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business. |
| **Project Preparation & Marketing analysis** | Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix. |
| **Institutions Support** | Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme. |
| **Investment Procurement** | Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes. |
| **5. Productivity** | Duration : 10 Hrs.<br>Marks : 05 |
| **Benefits** | Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard. |
| **Affecting Factors** | Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down. |
| **Comparison with developed countries** | Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages. |
| **Personal Finance Management** | Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance. |
| **6. Occupational Safety, Health and Environment Education** | Duration : 15 Hrs.<br>Marks : 06 |
| **Safety & Health** | Introduction to Occupational Safety and Health importance of safety and health at workplace. |
| **Occupational Hazards** | Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention. |
| **Accident & safety** | Basic principles for protective equipment. |

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|---|---|
| | Accident Prevention techniques - control of accidents and safety measures. |
| **First Aid** | Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person. |
| **Basic Provisions** | Idea of basic provision legislation of India.<br>safety, health, welfare under legislative of India. |
| **Ecosystem** | Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance. |
| **Pollution** | Pollution and pollutants including liquid, gaseous, solid and hazardous waste. |
| **Energy Conservation** | Conservation of Energy, re-use and recycle. |
| **Global warming** | Global warming, climate change and Ozone layer depletion. |
| **Ground Water** | Hydrological cycle, ground and surface water, Conservation and Harvesting of water. |
| **Environment** | Right attitude towards environment, Maintenance of in -house environment. |
| **7. Labour Welfare Legislation** | Duration : 05 Hrs.<br>Marks : 03 |
| **Welfare Acts** | Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act. |
| **8. Quality Tools** | Duration : 10 Hrs.<br>Marks : 05 |
| **Quality Consciousness** | Meaning of quality, Quality characteristic. |
| **Quality Circles** | Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles. |
| **Quality Management System** | Idea of ISO 9000 and BIS systems and its importance in maintaining qualities. |
| **House Keeping** | Purpose of House-keeping, Practice of good Housekeeping. |
| **Quality Tools** | Basic quality tools with a few examples. |

# 10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

**Block – I**

1. **Pipe Work**
    - Flaring of small copper pipes/ SS pipes and their jointing.
    - Thread cutting on pipes hand and lathe.
    - Pipe jointing with fitting.
    - Laying out steamed water and gas pipes.
    - Lagging steam and refrigeration pipe.
2. **Electrical Wiring and repair**
    - Skinning of cable insulation and jointing.
    - Wiring of switches, wall sockets, fuse blocks, etc.
    - Wiring circuits in series and parallel.
    - Use of current measuring instruments.
    - Use of electric meter.
    - Testing polarity in circuit.
    - Connecting domestic appliances in use in the dairy industry.
    - Connecting electric motors.
    - Study of pesto flash and Air circulation and their maintenance.
3. **Welding**
    - Preparation of job for various types of welds.
    - Gas welding uses of different sized nozzle and flame adjustment.
    - Gas cutting.
    - Butt and lap welding use proper filler rods.
    - Vertical, horizontal and overhead welding.
    - Welding of inside and outside corner joints.
    - Welding of steel cast iron and SS steel.
    - Argon arc welding.
4. **Steam Boiler**
    - Basic knowledge of various boiler mounting.
    - Basic knowledge of various boiler auxiliaries.
    - General idea of cleaning and preparation of boiler for inspection.
    - General idea of stoking and adjustment of draught for proper steam pressure.
5. **Refrigeration**
    - Cleaning and assembling of refrigerator components.
    - Leak detection and rectification.
    - Changing of control.
    - Surging on condensable gases and draining of oil.
    - Operation of deep freezing machine.

- Operation of ice-cream freezers-batch and continuous types.
- Control of oven and refrigeration.
- Servicing of refrigeration machines.

**Block – II**

6. **Pumps**
    - Working knowledge of Air Conditioners.
    - Working knowledge of Centrifugals and homogenizers, and centrifugal pumps.
7. **Packaging**
    - Operation, servicing and maintenance of feeding and package equipments.
    - Servicing and maintenance of conveying and washing/ sterilizing equipments.
8. **General Plant work**
    - Operation and maintenance of cream separators, HTS, Pasteurizers, UHT clarifiers.
    - Maintenance of Butter churns (batch & continuous) cheese vats press and mills.
    - Operation and maintenance of milk evaporators, vacuum pump.
    - Disassembling, assembling, operation and maintenance of spray drying plant and its components.
    - Repairing of packing and sealing equipment used in the dairy i.e. butter packing, cheese packing sealing and tin sealing automatic and semi-automatic.
    - General maintenance of the plant and examination.
    - Study and maintenance if energy conserving devices use for dairy maintenance.



**Note:**

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.
2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

## ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

| MECHANIC DAIRY MAINTENANCE | | | |
|---|---|---|---|
| **LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)** | | | |
| **A. TRAINEES TOOL KIT ( For each additional unit trainees tool kit Sl. 1-18 is required additionally)** | | | |
| **Sl. no.** | **Name of the Tool & Equipments** | **Specification** | **Quantity** |
| 1 | Steel Rule | 15 cm with metric graduation | 21 nos. |
| 2 | Try Square. | 150 mm blade | 21 nos. |
| 3 | Caliper inside spring type. | 150 mm | 21 nos. |
| 4 | Caliper hermaphrodite spring type | 150 mm | 21 nos. |
| 5 | Caliper outside spring type | 150 mm | 21 nos. |
| 6 | Divider spring type | 150 mm | 21 nos. |
| 7 | Scriber | 150 mm | 21 nos. |
| 8 | Centre Punch | 10 mm and Length - 120 mm | 21 nos. |
| 9 | Screw driver | 150mm insulated flat type | 21 nos. |
| 10 | Chisel cold flat | 20 mm X 150 mm High carbon steel | 21 nos. |
| 11 | Hammer ball peen With handle | 450 grams (1 lb) | 21 nos. |
| 12 | Hammer ball peen With handle. | 220 grams (1/2 lb) | 21 nos. |
| 13 | File flat - second cut | 250 mm | 21 nos. |
| 14 | File flat smooth | 250 mm. | 21 nos. |
| 15 | File half round second cut | 150 mm. | 21 nos. |
| 16 | Hacksaw frame fixed type | 300 mm | 21 nos. |
| 17 | Safety goggles. | | 21 nos. |
| 18 | Dot punch | 100 mm | 21 nos. |
| 19. | File flat rough double cut | 200mm | 21 nos. |
| 20. | File, half round, fine double cut | length 150mm | 21 nos. |
| 21. | File, round, fine double cut | length 150mm | 21 nos. |
| 22. | File flat, fine double cut, | length 150mm | 21 nos. |
| 23. | File square, fine double cut, | length 150mm | 21 nos. |
| 24. | File triangular fine double cut | length 150mm | 21 nos. |
| 25. | Scriber | 150mm length | 21 nos. |
| 26. | Centre punch | length 100mm | 21 nos. |
| 27. | Try square | 150 mm | 21 nos. |
| 28. | Divider spring joint | length 150mm | 21 nos. |
| 29. | Caliper spring joint in side | length 150mm | 21 nos. |
| 30. | Caliper, odd leg, spring joint | length 150mm | 21 nos. |
| 31. | Hammer ball pain | 220 gms. | 21 nos. |
| 32. | Cold Chisel flat and cross cut | length 150mm | 21 nos. |

| | | | |
|---|---|---|---|
| 33. | Engineers rule | 300mm long | 21 nos. |
| 34. | Tape measuring | 10m graduation in mm | 21 nos. |
| 35. | Pliers combination insulated | length 200mm | 21 nos. |
| 36. | Pliers long nose | 200 mm | 21 nos. |
| 37. | Pliers flat nose | 150mm | 21 nos. |
| 38. | Line tester | 500 v heavy duty | 21 nos. |
| 39. | End cutting nipper | 15cm | 21 nos. |
| 40. | Tweezers | 10 cm | 21 nos. |
| 41. | Gloves for welding[Treated as consumable] | | 21 nos. |
| 42. | Leather Apron [Treated as consumable] | | 21 nos. |
| **B : INSTRUMENTS & GENERAL SHOP OUTFIT** | | | |
| 43. | Steel Rule | 30 cm | 4 nos. |
| 44. | Steel Rule | 60 cm. | 4 nos. |
| 45. | Straight edge | 45 cm steel | 2 nos. |
| 46. | Surface plate | 45 x 45 cm CI / Granite. | 1 nos. |
| 47. | Marking table | 91 x 91 x 122 cm. | 1 no. |
| 48. | Universal scribing block | 22 cm. | 2 nos. |
| 49. | V-Block pair | 7 cm and 15 cm with clamps | 2 nos. |
| 50. | Square adjustable | 15 cm blade. | 2 nos. |
| 51. | Angle plate | 10 x 20 cm. | 1 nos. |
| 52. | Spirit Level | 15 cm metal | 1 no. |
| 53. | Punch letter | 3 mm set. | 1 no. |
| 54. | Punch number set | 3 mm. | 1 no. |
| 55. | Punch hollow | 6 mm to 19 set of 5 | 2 nos. |
| 56. | Punch round | 3mm x 4 mm set of 2 | 2 nos. |
| 57. | Portable hand drill (Electric) | 0 to 6 mm | 1 nos. |
| 58. | Drill twist straight shank | 1.5 to 12 mm by 0.5 mm | 1 Set |
| 59. | Drill twist straight shank | 8 mm to 15 mm by ½ mm | 1 Set |
| 60. | Taps and dies | complete set in box B.A | 1 no. |
| 61. | Taps and dies | complete set in box with-worth. | 1 no. |
| 62. | Taps and dies | complete set in box 3-18 mm set of 10 | 1 no. |
| 63. | File warding | 15 cm smooth | 4 nos. |
| 64. | File knife edge | 15 cm smooth | 4 nos. |
| 65. | File cut saw | 15 cm smooth | 2 nos. |
| 66. | File Rounded edge | 15 cm smooth | 2 nos. |
| 67. | File triangular | 15 cm smooth | 2 nos. |
| 68. | File round | 20 cm second cut | 4 nos. |
| 69. | File square | 15 cm second cut | 4 nos. |
| 70. | File square | 25 cm second cut | 4 nos. |
| 71. | Feeler gauge | 10 blades | 1 set |

| | | | |
|---|---|---|---|
| 72. | File triangular | 20 cm second cut. | 4 nos. |
| 73. | File triangular | 15 cm second cut. | 4 nos. |
| 74. | File flat | 30 cm second cut. | 4 nos. |
| 75. | File flat | 20 cm bastard | 4 nos. |
| 76. | File flat | 30 cm bastard. | 4 nos. |
| 77. | File half round | 25 cm second cut. | 4 nos. |
| 78. | File Swiss type needle | set of 12. | 2 sets |
| 79. | File round. | 30 cm bastard | 4 nos. |
| 80. | File hand | 15 cm second cut. | 8 nos. |
| 81. | Card file. | | 4 nos. |
| 82. | Oil Stone | 15 cm x 5 cm x 2.5 cm | 4 nos. |
| 83. | Stone carborandum | 15 cm x 5 cm x 5 cm x 4 cm. | 2 nos. |
| 84. | Oil Can | 0.25 litres. | 2 nos. |
| 85. | Pliers combination | 15 cm | 2 nos. |
| 86. | Soldering Iron | 350 gm. | 2 nos. |
| 87. | Blow Lamp | 0.50 liters. | 2 nos. |
| 88. | Spanner D.E. | 6 -26 mm set of 10 pcs. | 2 set. |
| 89. | Spanner adjustable | 15 cm | 1 nos. |
| 90. | Interchangeable ratchet socket | set with a 12 mm driver, sized10-32 mm set of 18 socket & attachments. | 1 set |
| 91. | Box spanner set | 6-25 mm set of 8 with Tommy bar. | 1 set |
| 92. | Glass magnifying | 7 cm | 1 nos. |
| 93. | Clamp toolmaker | 5 cm and 7.5 cm set of 2. | 2 nos. |
| 94. | Clamp “C” | 5 cm | 2 nos. |
| 95. | Clamp “C” | 10 cm | 2 nos. |
| 96. | Hand Reamer adjustable cover max | 9 ,12,18mm – set of 3 | 1 set |
| 97. | Hand Reamer taper | 4 -9mm set of 6 OR 4 -7 mm set of 4. | 1 set |
| 98. | Reamer parallel | 12 – 16mm set of 5. | 1 no. |
| 99. | Scrapeer flat. | 15 cm | 4 nos. |
| 100. | Scrapeer triangular | 15 cm | 2 nos. |
| 101. | Scrapeer half round | 15cm | 2 nos. |
| 102. | Chisel cold | 9 mm cross cut | 2nos |
| 103. | Chisel cold | 19 mm flat | 2 nos. |
| 104. | Chisel cold | 9 mm round nose. | 2 nos. |
| 105. | Stud Extractor EZY – out | | 2 nos. |
| 106. | Combination Set | 30 cm. | 2 nos. |
| 107. | Micrometer | 0 – 25 mm outside. | 2 nos. |
| 108. | Micrometer inside with extension rods. | 25 – 50 mm | 1 no. |
| 109. | Vernier caliper | 15 cm | 2 no. |
| 110. | Vernier height gauges | 30 cm. | 1 no. |

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| 111. | Vernier bevel protractor. | | 1 no. |
| 112. | Screw pitch gauge. | | 1 no. |
| 113. | Wire gauge, metric standard. | | 1 no. |
| 114. | Drill twist Taper Shank | 12 mm to 25 mm x 1.5. | 1 no |
| 115. | Drill chuck | 12 mm. | 1 no. |
| 116. | Pipe wrench | 40 cm | 1 no. |
| 117. | Pipe vice | 100mm | 1 no. |
| 118. | Adjustable pipe die set | cover pipe size 15, 20, 25,32,38,50 mm with die stock | 1 no. |
| 119. | Wheel dresser | One for 4 units | 1 no |
| 120. | Machine vice | 10 cm. | 1 no. |
| 121. | Machine vice. | 15 cm | 1 no. |
| 122. | Sleeve drill Morse | 0 – 1, 1 – 2, 2 – 3. | 1 Set |
| 123. | Vice bench. | 12 cm jaws | 20 nos. |
| 124. | Vice leg. | 10 cm jaw | 2 nos. |
| 125. | Lathe tools H.S.S. tipped set. | | 2 nos. |
| 126. | Lathe tools bit. | 6 mm x 75 mm | 2 nos. |
| 127. | Lathe tools bit | 8 mm x 75 mm. | 2 nos. |
| 128. | Lathe tools bit. | 10 mm x 85mm | 2 nos. |
| 129. | Arm strong type tool bit holder R.H. | | 2 nos. |
| 130. | Arm strong type tool bit holder L.H. | | 2 nos. |
| 131. | Arm strong type tool bit holder straight. | | 2 nos. |
| 132. | Bench working. | 240 x 120 x 90 cm | 4 nos. |
| 133. | Almirah. | 180 x 90 x 45 cm | 2 nos. |
| 134. | Lockers with 8 drawers. | standard size | 3 nos. |
| 135. | Metal rack | 182 x 182 x 45 cm | 1 no. |
| 136. | Instructor Table | | 1+1 no. |
| 137. | Instructor Chair | | 1 +1no. |
| 138. | Black board with easel. | | 1 no. |
| 139. | Fire extinguisher | For 4 Units | 2 nos. |
| 140. | Fire buckets. | | 2 nos. |
| 141. | Machine vice | 100mm. | 2 nos. |
| 142. | Wing compass. | 25.4 cm or 30 cm | 2 nos. |
| 143. | Hand hammer. | 1 kg. with handle | 2 nos. |
| 144. | Torque wrench | 14 to 68 Nm | 1 no. |
| 145. | Class room Chair | | 20 nos |
| 146. | Class Room table | | 20nos |
| 147. | Computer Chair | | 4+1 |
| 148. | Computer Table | | 4+1 |
| 149. | Desktop computer/Lap top with related MS office software | | 4+1 |

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| 150. | Discussion Table | 8’ x 4’ x 2½ ‘ | 2 |
| 151. | First- aid box | | As required |
| 152. | Instructional Material – Ref. books | | As required |
| 153. | Internet connection with all accessories | | As required |
| 154. | Laser printer | | 1 |
| 155. | LCD projector/ LED /LCD TV (42”) | | 1 |
| 156. | Digital thermometer [Treated as consumable] | Graduated disc analogy type | 1no. |
| 157. | Temperature &Humidity recorder | Capacity to record 24 hrs record | 1no. |
| 158. | Electronic leak detector Digital type | Capable to detect of R134a,HC,R-22 | 2nos. |
| 159. | Instrumentation screw driver set | 100mm | 5nos. |
| 160. | Digital weighing machine | 100 kg | 1no. |
| 161. | Recycling unit | | 1 no. |
| 162. | Quick couplers/Self sealing coupler [Treated as consumable] | 1/4 - 3/8” | 2 pairs for each |
| 163. | Schrader valve [Treated as consumable] | | 1 each |
| 164. | Cylinder 134 a | 5 kg | 1 no. |
| **C : GENERAL MACHINERY INSTALLATIONS** | | | |
| 165. | SS and SC centre lathe (all geared) with, auto feed system, coolant arrangement, lightening lamp, taper turning attachment, safety guard & standard accessories. | Minimum centre height 6”/150 mm & length 4.5“/ 1400 mm along with 3, 4 jaw chuck | 2 Nos. |
| 166. | Drilling machine pillar sensitive with swivel table motorized with chuck & key. | 0-20 mm cap | 1 no. |
| 167. | Drilling machine bench sensitive motorized with chuck and key. | 0-12 mm cap | 2 nos. |
| 168. | D.E. pedestal Grinding machine with diameter wheels rough and smooth with twist drill grinding attachment. | 200mm | 1 no. |
| 169. | Transformer welding set 150 amps.-continuous welding current, with all accessories and electrode holder | | 1set |
| 170. | Oxy -acetylene gas welding set equipment with hoses, regulator and other accessories. | | 1set |
| 171. | Split phase induction motor | ¼ hp, 230 V | 1 no. |

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| 172. | Capacitor start induction motor | ½ Hp, 230 V | 1 no. |
| 173. | AC 3 Phase motor, 400/50 Hz | 2 Hp | 1 no. |
| 174. | Star delta starter | 2 hp | 1 no. |
| 175. | Auto Transformer starter | 3 hp | 1 no. |
| 176. | D.O.L Starter | 2 hp | 1 no. |
| 177. | Portable air – LPC brazing kit | 2 kg. LPC cylinder, torches, houses, stand make | 1 no. |
| 178. | Oxy-acetylene welding set complete | cylinders, regulators welding torches with difference nozzles | 1 no. |
| 179. | Refrigerator | 165L carrying with HFC-134a, & HC | 2 Each |
| 180. | Frost free refrigerator | 200L carrying with HC blend | 2 nos. |
| 181. | Three/four door refrigerator | 300L carrying with HC R-600a | 2 nos. |
| 182. | Bench Drilling machine | 20 mm capacity,200-2500rpm | 1 no. |
| 183. | Grinding Machine | 200mm,3000rpm,Double ended1/2 hp | 1 no. |
| 184. | Evacuating and refrigerant charging station, consist of<br>a)Rotary two stage vacuum pump and motor (with gas ballast and anti such back)<br>b) manifold with gauges and valves and capable of pulling vacuum up to 50 microns of Hg and with provision of connecting to a microns level vacuum gauge<br>b)Graduated charging cylinder with provision for temperature correction and all necessary isolating valves<br>II) Evacuating and charging station as above but fitted with weighing scale | CAP. 2 kg. In lieu of (b) above and with accuracy of +/-1 g for charging hydrocarbons) | 1 no. |
| 185. | Two stage rotary vacuum pump | capacity approx. 60 – 10rmp capable of evacuating to 50 microns of Hg and fitted with gas ballast, anti such back valve and single phase motor | 1 no. |
| 186. | Air compressor, | two stage for oil – less dry air, with rush proof tank assembly, heater and controls max. pr. 10 kgs /sq.m Capacity 45 ltr. Motor 1 hp. | 1 no. |
| 187. | Reciprocating compressor | provision of capacity control etc. for demonstration. Capacity | 1 no. |

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| | | 9000Kcal/hr. semi hermetic open type. | |
| 188. | Dry N2 in cylinder | 2 stage regular or commercial N 2 in cylinder with drier unit and 2 stage regular 7meter cube | 1 no. |
| 189. | Window A.C | 1 Ton with R-22 or HFC Blend reciprocating compressor | 2 nos. |
| 190. | Split A.C | 1.5 Ton with R134a or R-22 reciprocating compressor | 2 nos. |
| 191. | Duct able split A.C 1.5 ton | 1.5 Ton with R134a or R-22 reciprocating compressor | 1 no. |
| 192. | Recovery unit with cylinders | CFC & 134 a | 1 each |
| 193. | Heat pump | 3000 Kcal/hr | 1 no. |
| 194. | Cassette Air conditioner | 4500 kcal/hr with R-404 . | 1 no. |
| 195. | De scaling pump set | with stainless steel impeller and housing complete with motor 1/2 hp and accessories | 1 no. |
| 196. | Small capacity shell and tube condenser | 5 Ton with Cu tubing only | 1 no. |
| 197. | Fan coil unit | with water valves (2 & 3 way) | 1 no. |
| 198. | Shell and tube, DX chillers (small) | 5 Ton with Cu tubing only | 1 no. |
| 199. | Circulating water pump (small) | 0.5 H.P with stainless steel tank capacity 20 liters with in let/ outlet provision. | 1 no. |
| 200. | Shell and tube type condenser | 5 Ton | 1 no. |
| 201. | Rotary hermetic compressor | 2 Ton | 1 no. |
| 202. | Screw compressor | 5Ton | 1 no. |
| 203. | scroll compressor | 1Ton | 1 |
| 204. | Bottle cooler visible | 200 L carrying with HFC-134a& reciprocating compressor | 1 no. |
| 205. | Deep freezer | 200 L carrying with HFC-134a& reciprocating compressor | 1 no. |
| 206. | Water cooler storage type | 200 L carrying with HFC-134a& reciprocating compressor | 1 no. |
| 207. | Ice candy plant | 2 ton with capacity to make 32 ice candy at a time with Forma tray, stainless steel tank on trolley | 1 no. |
| 208. | Walk in cooler | 3 Ton cap. with open type compressor, water cooled condenser, providing with PUF insulated room sealed proof size 8X8X10Ft maintain 0 - 5 degree centigrade. | 1 no. |

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| 209. | Air-conditioning, direct and indirect water chiller. | Complete with all controls including humidity control capacity 15000Kcal/hr | 1 no. |
| 210. | Package A/C | 7.5 ton capacity, Water cooled type with open type compressor reciprocating type | 1 no. |

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

**TRADE: MECHANIC DAIRY MAINTENANCE**

**LIST OF TOOLS& EQUIPMENTS FOR - 20 APPRENTICES**

**1) Space Norms** : 45 Sq. m.(For Engineering Drawing)

**2) Infrastructure:**

| **A : TRAINEES TOOL KIT:-** | | | |
|---|---|---|---|
| **Sl. No.** | **Name of the items** | **Specification** | **Quantity** |
| 1. | Draughtsman drawing instrument box | | 21 |
| 2. | Set square celluloid $45^o$ | (250 X 1.5 mm) | 21 |
| 3. | Set square celluloid $30^o$-$60^o$ | (250 X 1.5 mm) | 21 |
| 4. | Mini drafter | | 21 |
| 5. | Drawing board IS: 1444 | (700mm x500 mm) | 21 |
| **B : Furniture Required** | | | |
| **Sl. No.** | **Name of the items** | **Specification** | **Quantity** |
| 1 | Drawing Board | | 20 |
| 2 | Models : Solid & cut section | | as required |
| 3 | Drawing Table for trainees | | as required |
| 4 | Stool for trainees | | as required |
| 5 | Cupboard (big) | | 01 |
| 6 | White Board | (size: 8ft. x 4ft.) | 01 |
| 7 | Trainer's Table | | 01 |
| 8 | Trainer's Chair | | 01 |

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

**ANNEXURE-II**

## FORMAT FOR INTERNAL ASSESSMENT

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

| Sl. No | Candidate Name | Father's/Mother's Name | Safety consciousness | Workplace hygiene | Attendance/ Punctuality | Ability to follow Manuals/ Written instructions | Application of Knowledge | Skills to handle tools & equipment | Economical use of materials | Speed in doing work | Quality in workmanship | VIVA | Total internal assessment Marks | Result (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Maximum Marks (Total 100 Marks)** | | | **15** | **5** | **10** | **5** | **10** | **10** | **5** | **10** | **15** | **15** | | |
| **1** | | | | | | | | | | | | | | |
| **2** | | | | | | | | | | | | | | |