



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

**COMPETENCY BASED CURRICULUM**

# DAIRYING

(Duration: One Year)

**CRAFTSMEN TRAINING SCHEME (CTS)**

**NSQF LEVEL- 3.5**



**SECTOR – FOOD INDUSTRY**



Directorate General of Training

# DAIRYING

(Non-Engineering Trade)

(Revised in March 2023)

Version: 2.0

**CRAFTSMEN TRAINING SCHEME (CTS)**

**NSQF LEVEL – 3.5**

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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## **1. COURSE INFORMATION**

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During the one-year duration of 'Dairying' trade, a candidate is trained on Professional Skill, Professional Knowledge and Employability Skill related to job role. In addition to this, a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The broad components covered under Professional Skill subject are as below:

During the year, trainee learns about elementary first-aid, firefighting, environment regulation and housekeeping, etc. The trainee learns about different breeds of cows/ buffalos and handle new born calf. Learns to groom animals and maintain sanitation of sheds. Observe and identify symptoms of certain specific disease in animals. The trainee learns to prepare feed and fodder for dairy. He also learns about allied trades tools and basic machinery used in electrical and mechanical maintenance. The trainee learns to use and maintain boilers and associated system used in the dairy industry. The trainee learns to use and maintain refrigeration, air conditioning systems and instruments used in the dairy industry. He carries out various tests by collecting milk samples and determines the specific gravity of milk samples. Counts different types of microorganisms in milk samples and carries out COB and MBR tests. The trainee learns the process of pasteurization of milk. Prepares sterilized, toned, doubled toned milk, butter, ghee and other dairy products.

## 2. TRAINING SYSTEM

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### 2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of the economy/ labour market. The vocational training programs are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer programs of DGT for propagating vocational training.

‘Dairying’ trade under CTS is one of the popular courses delivered nationwide through a network of ITIs. The course is of one year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) impart professional skills and knowledge, while the core area (Employability Skill) imparts requisite core skills, knowledge, and life skills. After passing out the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

#### **Candidates broadly need to demonstrate that they are able to:**

- Read and interpret technical parameters/documents, plan and organize work processes, identify necessary materials and tools;
- Perform tasks with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge & employability skills while performing jobs.
- Document the technical parameters related to the task undertaken.

### 2.2 PROGRESSION PATHWAYS

- Can join industry as Craftsman and will progress further as Senior Craftsman, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship programs in different types of industries leading to a National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming an instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

### 2.3 COURSE STRUCTURE

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

S No.	Course Element	Notional Training Hours
1.	Professional Skill (Trade Practical)	840
2.	Professional Knowledge (Trade Theory)	240
3.	Employability Skills	120
	<b>Total</b>	<b>1200</b>

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

On the Job Training (OJT) / Group Project	150
Optional Courses (10th/ 12th class certificate along with ITI certification or add on short term courses)	240

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification or add on short term courses.

## 2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The Continuous Assessment (Internal) 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 formative assessment template provided on [www.bharatskills.gov.in](http://www.bharatskills.gov.in)

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

## 2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other 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 some of 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
- Computer based multiple choice question examination
- Practical Examination

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

Performance Level	Evidence
(a) Marks 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	<ul style="list-style-type: none"> <li>• Demonstration of good skills and accuracy in the field of work/ assignments.</li> </ul>

craftsmanship with occasional guidance, and due regard for safety procedures and practices	<ul style="list-style-type: none"> <li>• A fairly good level of neatness and consistency to accomplish job activities.</li> <li>• Occasional support in completing the task/ job.</li> </ul>
<b>(b) Marks in the range of 75%-90% to be allotted during assessment</b>	
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	<ul style="list-style-type: none"> <li>• Good skill levels and accuracy in the field of work/ assignments.</li> <li>• A good level of neatness and consistency to accomplish job activities.</li> <li>• Little support in completing the task/ job.</li> </ul>
<b>(c) Marks in the range of more than 90% to be allotted during assessment</b>	
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.	<ul style="list-style-type: none"> <li>• High skill levels and accuracy in the field of work/ assignments.</li> <li>• A high level of neatness and consistency to accomplish job activities.</li> <li>• Minimal or no support in completing the task/ job.</li> </ul>



### 3. JOB ROLE

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**Dairy Worker, General:** performs all or several tasks in preparation of various dairy products. Pasteurises raw milk or other dairy product to remove harmful bacteria. Develops bacterial culture for use in making butter, buttermilk, cheese and other products. Separates cream from milk and churns it into butter. Curdles milk and converts curds into cheese. May make ice-cream.

**Separator Man; Cream Separator:** Cream man (Dairy) operates milk separator to separate cream from milk. Assembles and adjusts separator as necessary, according to type of product for which separated cream or milk is to be used; places empty containers below cream and skimmed outlets; pours milk into separator; switches on centrifugal machine which automatically carries milk into bowl and separates milk into fat and skimmed milk; regulates separator to obtain required percentage of cream for making butter or ghee; cleans plant using hot water, soda and other detergent solutions. May also attend to pasteurizing plant.

**Butter Maker:** performs all or several tasks for making butter. Pasteurizes milk to eliminate harmful bacteria. Separates cream from milk in centrifuge. Adds lactic ferment to ripen cream. Pours or pumps cream into mechanical churn. Starts churn to make butter, controlling butter moisture, temperature and time of churning. May add salt to butter in churn. May take samples of butter for testing. May boil and strain butter to make 'ghee' and be designated as GHEE MAKER

**Cheese Maker:** cooks milk and specified ingredients to make cheese according to formula. Pasteurizes and separates milk to obtain prescribed butter fat content; turns valves to fill vat with milk and heat milk to specified temperature; starts agitator to mix ingredients; tests samples of milk for acidity and allows agitator to mix ingredients until specified level of acidity is reached; dumps and mixes measured amount of rennet into milk; stops agitator to allow milk to coagulate into curd; cuts curd or separates curd with hand scoop to release whey (watery part); observes thermometer, adjusts steam valve, and starts agitator to stir and cook curd at prescribed temperature for specified time; squeezes and stretches sample of curd with fingers and extends cooking time to achieve desired firmness or texture; scoops curd into burlap containers to drain off excess moisture; places cheese in moulds and presses it into shape. May salt cheese by immersing them in brine or roll cheese in dry salt, pierce or smear cheese with cultured wash to develop mould growth, and place or turn cheese blocks on shelves to cure cheese. May supervise ripening of cheese. May specialize in making particular type of cheese. May Pasteurise milk and operate centrifugal machine to separate cream out of pure milk.

**Dairy Workers (non-farm), Other:** include all other dairy workers not elsewhere classified, for example, those salting cheese by immersing them in brine or by rubbing them with dry salt,

sterilizing milk; operating machines which homogenise milk, moulding butter or cheese into shape, packing and wrapping butter with paper, making condensed or powdered milk, etc. and may be designated according to nature of work performed.

**Reference NCO-2015:**

- (i) 7513.0100 – Dairy Worker, General;
- (ii) 7513.0200 – Separator Man
- (iii) 7513.0300 – Butter Maker
- (iv) 7513.0400 – Cheese Maker
- (v) 7513.9900 – Dairy Workers (non-farm), Other

**Reference NOS: -**

AGR/N9406, AGR/N9407, AGR/N4101, AGR/N4102, AGR/N4104, AGR/N4103, AGR/N4106, AGR/N9408, AGR/N4220, AGR/N4221, AGR/N9409, AGR/N9410, AGR/N9411, AGR/N9412, AGR/N9413, AGR/N9414, AGR/N4107, AGR/N4121, AGR/N9415

## 4. GENERAL INFORMATION

<b>Name of the Trade</b>	<b>DAIRYING</b>
<b>NCO - 2015</b>	7513.0100, 7513.0200, 7513.0300, 7513.0400, 7513.9900
<b>NOS Covered</b>	AGR/N9406, AGR/N9407, AGR/N4101, AGR/N4102, AGR/N4104, AGR/N4103, AGR/N4106, AGR/N9408, AGR/N4220, AGR/N4221, AGR/N9409, AGR/N4212, AGR/N9410, AGR/N9411, AGR/N9413, AGR/N9414, AGR/N4107, AGR/N4121, AGR/N9415
<b>NSQF Level</b>	Level-3.5
<b>Duration of Craftsmen Training</b>	One Year (1200 Hours+150 hours OJT/Group Project)
<b>Entry Qualification</b>	Passed 10 <sup>th</sup> class examination
<b>Minimum Age</b>	14 years as on first day of academic session.
<b>Eligibility for PwD</b>	LD, LC, DW, AA, LV, HH, DEAF, AUTISM, SLD, ID
<b>Unit Strength (No. of Student)</b>	24 (There is no separate provision of supernumerary seats)
<b>Space Norms</b>	125 Sq. m.
<b>Power Norms</b>	3 KW
<b>Instructors Qualification for:</b>	
<b>(i) Dairying Trade</b>	<p>B.Voc/Degree in Dairy from UGC recognised board with two years Experience.</p> <p style="text-align: center;"><b>OR</b></p> <p>Diploma (Minimum 2 years) in Dairy from recognised board or relevant Advanced Diploma (Vocational) from DGT with two years Experience.</p> <p style="text-align: center;"><b>OR</b></p> <p>Passed Craftsman Training Course in the Dairy trade under NCVT with five years experience.</p> <p><b><u>Essential Qualification:</u></b> Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT.</p> <p><b>NOTE:-Out of two Instructors required for the unit of 2 (1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However both of them must possess NCIC in any of its variants.</b></p>
<b>(ii) Employability Skill</b>	<p>MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills. (Must have studied English/ Communication Skills and Basic</p>

	Computer at 12th / Diploma level and above) <b>OR</b> Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills.
<b>(iii) Minimum Age for Instructor</b>	21 Years
<b>List of Tools and Equipment</b>	As per Annexure – I

## 5. LEARNING OUTCOME

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

### 5.1 LEARNING OUTCOMES

1. Recognize different breeds of Cows & buffaloes following safety precautions. (NOS: AGR/N9406)
2. Handle the new born calf, its sanitation etc. (NOS: AGR/N9407)
3. Plan the floor arrangement after different animal houses. (NOS: AGR/N4101, AGR/N4102)
4. Groom & wash the animals along with cleaning & sanitation of sheds. (NOS: AGR/N4102)
5. Observe & identify symptoms of certain specific disease in animals. (NOS: AGR/N4104)
6. Prepare feed and fodder for Dairy. (NOS: AGR/N4103, AGR/N4106)
7. Use and maintain boilers and associated system machinery used in Dairy. (NOS: AGR/N9408)
8. Use and maintain the Refrigeration and Air Conditioning system used in Dairy. (NOS: AGR/N4220, AGR/N4221)
9. Use and maintain instrumentation system used in Dairy. (NOS: AGR/N9409)
10. Carryout various tests by collecting milk sample. (NOS: AGR/N4212)
11. Determine the specific gravity of milk samples and carry out test using various testing techniques. (NOS: AGR/N9410)
12. Count different types of microorganisms and milk samples. (NOS: AGR/N9411)
13. Carry out COB and MBR tests. (NOS: AGR/N9412)
14. Carryout Pasteurization of milk. (NOS: AGR/N9413)
15. Prepare sterilized, toned and doubled toned milk followed by packing. Prepare butter, ghee and other dairy products. (NOS: AGR/N9414)
16. Maintain records, balance sheet and other related documents used in dairy industry. (NOS: AGR/N4107, AGR/N4121)
17. Apply the milk safety rules as per standard norms. (NOS: AGR/N9415)

## 6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Recognize different breeds of Cows & buffaloes following safety precautions. (NOS: AGR/N9406)	Recognize different breeds of cows and buffaloes.
	Recognize external anatomy of cow and buffalo.
2. Handle the new born calf, its sanitation etc. (NOS: AGR/N9407)	Demonstrate care of new born calf/handling of new born calf.
	Explain sanitation to be maintained for new born calf.
	Explain cutting and sealing of naval cord.
3. Plan the floor arrangement after different animal houses. (NOS: AGR/N4101, AGR/N4102)	Draw sketch of floor plan for different animal houses.
4. Groom & wash the animals along with cleaning & sanitation of sheds. (NOS: AGR/N4102)	Demonstrate grooming and washing of animals.
	Demonstrate cleaning and sanitation of sheds.
5. Observe & identify symptoms of certain specific disease in animals. (NOS: AGR/N4104)	Explain signs of good health of dairy animals.
	Explain symptoms of certain specific diseases in animals.
6. Prepare feed and fodder for Dairy. (NOS: AGR/N4103, AGR/N4106)	Identify various feeds, fodders, feed supplements and additives in different seasons.
	Identify animal feed adulterants by physical methods. Grinding and mixing of feed ingredients.
	Calculate feed and fodder requirements for various categories of dairy animals viz. Growing, heifers, bull calves, bulls, pregnant cows, lactating cows etc.
	Demonstrate cleaning and fumigation of feed stores. Storing of prepared feed.
	Carry out mixing of feed ingredients.
	Perform packaging of mineral and concentrate mixture storing of prepared feed.
7. Use and maintain boilers and associated system machinery used in Dairy.(NOS:	Work in compliance with boiler safety.
	Perform operation of boiler feed water pumps, fans etc.
	Perform operation of fuel feeding mechanism

AGR/N9408)	Perform control of steam pressure temperature and stem flow.
8. Use and maintain the Refrigeration and Air Conditioning system used in Dairy.(NOS: AGR/N4220, AGR/N4221)	Identify refrigeration system components and refrigeration service tools.
	Perform dismantling of compressor.
	Perform servicing of air cooled condenser.
	Perform checking of leak repair and testing of evaporator, removal of oil.
	Perform checking of automatic and thermostatic expansion switches, valves and capillary tube.
	Perform oil charging in compressor, installing compressor, electric wiring of refrigeration system
9. Use and maintain instrumentation system used in Dairy.(NOS: AGR/N9409)	Calibrate pressure gauge on dead weight tester and by standard calibration.
	Explain construction and operation of pressure regulating valve and filter.
	Calibrate different types of pressure recorder.
10. Carryout various tests by collecting milk sample.(NOS: AGR/N4212)	Perform chemical quality of milk, Reception, weightment and sampling of milk.
	Platform tests for milk, sampling of milk and milk products for microbiological and chemical analysis
	Explain preservation process of milk samples.
11. Determine the specific gravity of milk samples and carry out test using various testing techniques. (NOS: AGR/N9410)	Explain filters & clarifiers of milk and various parts of separator.
	Carry out different SNF tests for milk.
	Determine specific gravity of milk by lactometer.
	Determine titratable acidity of milk.
12. Count different types of microorganisms and milk samples. (NOS: AGR/N9411)	Identify and count different types of microorganism.
	Carry out presumptive test.
13. Carry out COB and MBR tests.(NOS: AGR/N9412)	Carry out sediment test,
	Carry out clot-on-boiling test (COB).
	Carry out methyl blue reduction (MBR) test.
14. Carryout Pasteurization of milk.(NOS: AGR/N9413)	Demonstrate separation, Standardization and Homogenization of milk.

	Perform pasteurization of milk by HTST method.
	Perform pasteurization of milk by LTLT method.
15. Prepare sterilized, toned and doubled toned milk followed by packing. (NOS: AGR/N9414)	Perform packaging of milk in bottles, cans and sachets.
	Prepare Toned and Double Toned milk.
	Prepare flavoured milk and chocolate milk.
	Prepare sterilized milk by batch Methods.
	Prepare butter.
16. Maintain records, balance sheet and other related documents used in dairy industry.(NOS: AGR/N4107,AGR/N4121)	Demonstrate handling of Audio-Visual Aids.
	Explain milk Co-operative Society and dairy entrepreneur.
17. Apply the milk safety rules as per standard norms. (NOS: AGR/N9415)	Demonstrate application HACCP in dairy plant.
	Demonstrate application GMP in dairy plant.
	Demonstrate the dairy waste.



SYLLABUS FOR DAIRYING TRADE			
DURATION: ONE YEAR			
Duration	Reference Learning Outcome	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
Professional Skill 30Hrs; Professional Knowledge 09Hrs	Recognize different breeds of Cows & buffaloes following safety precautions.	1. Visit to different dairy farms. 2. Recognize different breeds of cows and buffaloes. External anatomy of cow and buffalo.	Present status and future prospects of dairy industry. Role of dairy animals in Indian farming. Important Indian and exotic dairy breeds of cattle and buffaloes, their origin, distribution and characteristics.
Professional Skill 30 Hrs; Professional Knowledge 09 Hrs	Handle the new born calf and its sanitation etc.	3. Care of new born calf/ handling of new born calf, its sanitation, cutting and sealing of naval cord.	Economic characters of dairy animals. Control of dairy animals. Dairy animal improvement through breeding.
Professional Skill 30 Hrs; Professional Knowledge 09Hrs	Plan the floor arrangement for different animal houses.	4. Drawing sketch of floor plan for different animal houses.	Principles and design of animal housing. Location and layouts of animal sheds. Sanitation in dairy farm.
Professional Skill 30 Hrs; Professional Knowledge 09Hrs	Groom & wash the animals along with cleaning & sanitation of sheds.	5. Grooming & washing of animals. Cleaning & sanitation of sheds.	Animal response to environment changes, protection against heat & cold. Farm washes, availability, collection and utilization. Disposal of dead animals.
Professional Skill 30 Hrs; Professional Knowledge 09 Hrs	Observe & identify symptoms of certain specific disease in animals.	6. Observing signs of health in dairy animals. Observing and identifying symptoms of certain specific diseases in animals. Pressing of wounds.	First aid for common animals. Knowledge of common contagious and infectious diseases, preventive measures.
Professional Skill 140 Hrs;	Prepare, feed and fodder for Dairy.	7. Identification of various feeds, fodders, feed supplements and	Importance of feeding of dairy animal. Classification of feeds: A. Roughages- leguminous

Professional Knowledge 36 Hrs		<p>additives in different seasons.</p> <p>8. Identification of animal feed adulterants by physical methods. Grinding and mixing of feed ingredients</p> <p>9. Calculation of feed and fodder requirements for various categories of dairy animals viz. Growing, heifers, bull calves, bulls, pregnant cows, lactating cows etc.</p> <p>10. Visits to feed laboratory and cattle Feed manufacturing units. Feeding and watering of calves, heifers, pregnant &amp; lactating cows and bulls.</p> <p>11. Visit to markets for assessing availability and knowing prices of feed ingredients.</p> <p>12. Cleaning and fumigation of feed stores. Storing of prepared feed.</p> <p>13. Mixing of feed ingredients. Packaging of mineral and concentrate mixture storing of prepared feed.</p>	<p>and</p> <ul style="list-style-type: none"> <li>- non-leguminous</li> <li>- succulent and dry</li> </ul> <p>B. Concentrates- energy and protein feeds</p> <p>C. Feed supplements- minerals and vitamins.</p> <p>Classification of nutrients and their role in animal body, water, carbohydrates, proteins, lipids, minerals and vitamins.</p> <p>Feeding of various categories of dairy animals, pregnant and newly calved cows, new born calf, growing calves, heifers bull-calves, lactating cows, dry cows and bulbs.</p> <p>Methods of purchasing, procurement of feed ingredients and their physical evaluation.</p> <p>Compounding of feeds- objectives, advantages, methods and machinery for compounding.</p> <p>Major nutritional disorders and their preventive-milk fever, grass tetany , rickets, bloat etc.</p> <p>Packaging and forwarding of feeds-materials for packaging methods of packaging and transportation.</p> <p>Storage of concentrates- storage types, space requirement, cleaning and fumigation of stores, precautions in use of pesticides.</p>
Professional Skill30 Hrs;	Use and maintain boilers and associated system	<p><b>Boiler:</b></p> <p>14. Boiler safety precautions. Operation</p>	<p>Steam - its heating and power properties. Principles of steam and application in</p>

Professional Knowledge 06 Hrs	machinery used in Dairy.	<p>of boiler feed water pumps, fans etc. Operation of fuel feeding mechanism.</p> <p>15. Reading and control of steam pressure temperature and stem flow.</p> <p>16. Working in steam boiler and economizer.</p>	<p>boilers. Steam generation, steam distribution, condensate handling etc.</p> <p>Boiler mounting and fittings. Description and use of safety valves and other types of valves. Types of boilers, their brief study.</p>
Professional Skill 60 Hrs;  Professional Knowledge 24 Hrs	Use and maintain the Refrigeration and Air Conditioning system used in Dairy.	<p><b>Refrigeration and air conditioning :-</b></p> <p>17. Identification of refrigeration system. Stripping components, care and safety. Use of refrigeration service tools - care and safety.</p> <p>18. Dismantling of different types of compressors. Checking and servicing of components. Assembly and testing.</p> <p>19. Servicing air cooled condenser. Checking leak repair and testing. Servicing evaporator, removal of oil, checking, leak repair and testing.</p> <p>20. Checking automatic and thermostatic expansion switches, valves and capillary tube. Servicing and testing.</p> <p>21. Oil charging to compressor, installing compressor, electric wiring of refrigeration system.</p> <p>22. Testing leak in the refrigeration system. Effect of over charge</p>	<p>Principle system and application of refrigeration. Refrigeration components - type specification and use. Refrigeration compressor. Its function, mode of drive, types of compressors -classification and application. Construction and function. Advantages and disadvantages of different types.</p> <p>Condenser - its function, type, classification, construction and application. Evaporator - its function, type, classification, construction and application.</p> <p>Refrigeration control - function and type. Automatic, thermostatic and capillary control, Construction, operation and application.</p> <p>Oil used in refrigeration system, their desirable properties. Leak detectors - their type, specification, use and care. Refrigerants - their properties and use.</p> <p>Food preservation spoilage agents control of spoilage agents. Cold storage plant operation refrigerator, deep freezer, bottle cooler and water cooler, its common trouble and remedies.</p>

		<p>and under charge.</p> <p>23. Operation and servicing cold store cooling system. Control and instrument.</p> <p>24. Repair and maintenance of refrigerator and deep freezer. Bottle coolers and water coolers.</p>	
<p>Professional Skill 25Hrs;</p> <p>Professional Knowledge 18 Hrs</p>	Use and maintain instrumentation system used in Dairy.	<p><b>Instrumentation:</b></p> <p>25. Calibration of different types of pressure recorder.</p> <p>26. Maintenance and reconditioning of different types of thermometers and Thermocouples.</p>	<p>Different types of pressure gauges and their application. Types of manometer and their use. Construction and operation of differential Pressure transmitter. Pressure recorder - its type and construction. Construction of different types of thermometer and thermocouple. Know how of VFD/ Automation/ Self Starters</p>
<p>Professional Skill 90 Hrs;</p> <p>Professional Knowledge 21 Hrs</p>	Carryout various tests by collecting milk sample.	<p>27. Chemical quality of milk. Reception, weightment and sampling of milk.</p> <p>28. Platform tests for milk. Sampling of milk and milk products for microbiological and chemical analysis.</p> <p>29. Preservation of milk samples for Chemical</p> <p>30. Analysis, Sensory evaluation of milk.</p>	<p>Pricing of milk, composition of milk, factors affecting composition of milk; nutritive value of milk. Sensory and physio-Chemical properties of milk. Types of micro-organisms present in milk and their relation with public health. Grading and testing of milk for quality.</p>
<p>Professional Skill 90 Hrs;</p> <p>Professional Knowledge 18Hrs</p>	Determine the specific gravity of milk samples and carry out test using various testing techniques.	<p>31. Study of an immersion cooler, plate chiller, surface cooler and farm milk COOLER.</p> <p>32. Study of Filters &amp; clarifiers of milk and various parts of</p>	<p>Functioning of BMC, milk reception, different methods of chilling and storage, handling of milk at BMC, modes of transportation of chilled milk. Straining, filtration and clarification of milk.</p>

		separator. 33. Different SNF test for milk. Determination of specific gravity of milk by lactometer. 34. Determination of titratable acidity of milk	Principle of cream separation. Sampling procedures and testing the quality of milk at reception dock, chilling center; maintenance of milk receipt register
Professional Skill 30 Hrs;  Professional Knowledge 06 Hrs	Count different types of microorganisms and milk samples.	35. Identification and counting of different types of microorganism. Presumptive test.	Milk borne disease. Pathozenes and causative organism. Water borne disease, air borne disease, zoonotic diseases.
Professional Skill 60 Hrs;  Professional Knowledge 12 Hrs	Carry out COB and MBR tests.	36. Sediment test, Clot-on-boiling test. (COB) 37. Methyl blue reduction (MBR) test.	Principle of homogenization of milk, packaging of milk storage of processed milk. Importance of pasteurization, methods of pasteurization (LTLT, HTST).
Professional Skill 30 Hrs;  Professional Knowledge 06 Hrs	Carryout Pasteurization of milk.	38. Separation, Standardization and Homogenization of milk. 39. Pasteurization of milk by HTST and LTLT methods.	Dispensing of milk through bulk vending machines, cans, cartons, sachets and bottles. Handling losses and factors affecting milk solids losses.
Professional Skill 60 Hrs;  Professional Knowledge 12 Hrs	Prepare sterilized, toned and doubled toned milk followed by packing. Prepare of butter, ghee and other dairy products.	40. Packaging of milk in bottles, cans and sachets. 41. Preparation of Toned and Double Toned milk. 42. Preparation of flavored milk and chocolate milk. 43. Preparation of sterilized milk by batch Methods. 44. Preparation of butter.	Method of preparation of flavored, chocolate and sterilized milk, ghee, butter etc. And various milk products. Problems of storage, transportation and marketing of Dairy products.
Professional Skill 60 Hrs;	Maintain records, balance sheet and other related	45. Handling of Audio-Visual Aids. 46. Case study of a milk	Dairy Economics in large and small size dairy farm. Accounts keeping,

Professional Knowledge 12 Hrs	documents used in dairy industry.	Co-operative Society and Dairy entrepreneur.	Maintenance of Registers & Records, preparation of Balance Sheets etc. Marketing of milk and milk products.
Professional Skill 15 Hrs;  Professional Knowledge 24 Hrs	Apply the milk safety rules as per standard norms.	47. Application of HACCP and GMP, GHP in a Dairy plant. Utilization of dairy industry wastes: Whey utilization production.	Food regulation: Overview of Food Safety and Standards Act, 2006 BIS, ISO-22000, Agmark, HACCP, International Food Standards GMP. Importance of personal Hygiene, Cleaning & Sanitary standards of dairy industry.

## SYLLABUS FOR CORE SKILLS

1. Employability Skills ( Common for all CTS trades) (120 hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in [www.bharatskills.gov.in/](http://www.bharatskills.gov.in/) [www.dgt.gov.in](http://www.dgt.gov.in)

LIST OF TOOLS & EQUIPMENT			
DAIRYING (for batch of 24 Candidates)			
S No.	Name of the Tools and Equipment	Specification	Quantity
<b>A. TRAINEES TOOL KIT</b>			
1.	Stiff Brushes		6 Nos.
2.	Floor Brushes		7 Nos.
3.	Ear tags		100 Nos.
4.	Bull nose ring		2 Nos.
5.	Bull rope		10 ft.
6.	Milk strainer		1 No.
7.	Drenching bamboo		1 No.
8.	Enamel tray		2 Nos.
9.	Tongs		2 Nos.
10.	Mouth gag		1 No.
11.	Cattle Travis (wooden)		1 No.
12.	Sanitary Milking pails		2 Nos.
13.	Buckets		3 Nos.
14.	Milk feeding pail with nipple		1 No.
15.	Strip cup		1 No.
16.	Chains for cows		5 Nos.
17.	Chains for calves		5 Nos.
18.	Chaff cutter hand operated		1 No.
19.	Wheel harrows		1 No.
20.	Grinder (Elec. Operated)		1 No.
21.	Electrical Centrifuge		1 No.
22.	Refrigerator		1 No.
23.	Water distillation apparatus		1 No.
24.	Spirit Lamp		10 Nos.
25.	Hot air oven		1 No.
26.	pH meter		1 No.
27.	Stiff Brushes		2 Nos.
28.	Student's microscope		1 No.
29.	Water bath		1 No.



30.	Gerber centrifuge		15 Nos.
31.	Lactometer with jars		1 No.
32.	Milk plunger		1 No.
33.	Sediment testing equipment		1 No.
34.	Klett Colorimeter		1 No.
35.	Cream separator a) Hand operated b) Electricity operated		1 No.each
36.	Electrical Butter churn		1 No.
37.	Electrical Butter worker		2 Nos.
38.	Butter paper		1 (Ream)
39.	Sampler		1 No.
40.	Butter scoop		1 No.
41.	Weighing balance Double pan		1 No.
42.	Ice cream freezer (Hand operated)		1 No.
43.	Ice cream cutter		2 Nos.
44.	Frying pan	2 litres	2 Nos.
45.	Steel Bhagona	5 litres	1 No.
46.	Bottle capper		1 No.
47.	Milk	measures - 250 ml - do - 500 ml	1 No.
48.	Sterilizer		1 No.
49.	Stacking Trolley		1 No.
50.	Homogenizer		1 No.
51.	Trolley lift		1 No.
52.	Butter moisture balance		1 No.
53.	Measuring tape		1 No.
54.	Khurpi		2 Nos.
55.	Knife		3 Nos.
56.	Iron pans		3 Nos.
57.	Crowbar		5 Nos.
58.	Muffle furnace		1 No.
59.	Ice Cream Smoothie Machine		1 No.
60.	Ice Cream Blender		1 No.

#### **B. SHOP TOOLS & EQUIPMENT**

##### **List of Tools of GLASSWARE:**

61.	Clinical thermometer		5 Nos.
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62.	Thermometer		12 Nos.
63.	Automatic tilt measure for sulphuric acid		5 Nos.
64.	Automatic tilt measure for amyl alcohol		5 Nos.
65.	Pipette for milk	11.05 ml	12 Nos.
66.	Lactometer		5 Nos.
67.	Dairy Thermometer		5 Nos.
68.	Lactometer jars (aluminium)		5 Nos.
69.	Burettes	(0.01 sub-division)	12 Nos.
70.	Pipette	10 ml	12 Nos.
71.	Porcelain dish	10 ml cap.	5 Nos.
72.	Beakers	100 ml, 250 ml, 500 ml, 1000 ml	12 Nos. each
73.	Test tubes	cap. 15 ml	50 Nos.
74.	Milk bottles	250 ml	100 Nos.
75.	Kjeldhal flask	500 ml cap.	12 Nos.
76.	Round bottom Flask	1000 ml	12 Nos.
77.	Conical Flask	1000 ml	12 Nos.
78.	Funnels	10 cm dia	12 Nos.
79.	Measuring Cylinders	100 ml, 500 ml, 1000 ml	2 Nos. each
80.	Volumetric flask	100 m	2 Nos.
81.	Reagent bottles	250 ml, 500 ml	12 Nos. each
82.	Soxhlet apparatus		6 SET
83.	Wash bottles	cap. 500 ml	12 Nos.
84.	Glass rods		1 Kg.
85.	Indicator bottles		12 Nos.
86.	Sample bottles		50 Nos.
87.	Pipette, graduated	10ml 0.1 ml div.	5 Nos.
88.	Pipette, graduated	10 ml	5 Nos.
89.	1 ml division		
90.	Jar with over lapping lid	10 dia 12" high	5 Nos.
91.	Spirit lamp		12 Nos.
92.	Syringe	5 ml	2 Nos.
93.	Rubber bulbs for suction		12 Nos.
94.	Physical Balan		1 No.
95.	Test tube stand		17 Nos.
96.	Test tube hold		12 Nos.
97.	Alkali detergents		1 Kg.
98.	Gerber centrifuge		1 Nos.

99.	Filter paper	(11 cm dia)	2 BOXES
100.	Brushes to clean glassware		7 Nos
101.	Plastic aprons		7 Nos.
102.	Microscope		7 Nos.
103.	Cotton apron		12Nos.
104.	Gloves with sleeves		12 Nos.
105.	Plastic tubing		12 Nos.
106.	Sediment tester		2 Nos.

#### **C. LIST OF CHEMICALS, DETERGENTS AND PESTICIDES ETC.**

107.	Sulphuric Acid (C. Grade)		5 lit.
108.	Sulphuric acid (a.r)		500 ml.
109.	Sodium hydroxide		5 kg.
110.	Litmus paper		As required
111.	Filter paper (Whatman no. 1 and 40)		As required
112.	Petroleum ether	40° - 60° C	500 ml.
113.	Copper sulphate		500 gm.
114.	Sodium sulphate		500 gm.
115.	Potassium dichromate		500 gm.
116.	Sodium bicarbonate		500 gm.
117.	Petroleum jelly/liquid paraffin		50 gm.
118.	Spirit		5 Ltr
119.	Glucose		250 gm.
120.	Salt		250 gm.
121.	Urea		500 gm.
122.	Petroleum ether		500 gm.
123.	Mustard oil		1 Lltr
124.	Zinc oxide		500 gm.
125.	Caustic potash		5 kg.
126.	Phenol		500 gm.
127.	Alcohol		450 ml.
128.	Amyl Alcohol		500 ml.
129.	Phenolphthalein		100 ml.
130.	Methylene Blue		100 ml.
131.	Starch solution		100 ml.
132.	Iodine Solution		100 ml.

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<b>List of Expert contributed/ participated for finalizing the course curriculum of Dairying trade held on 20.02.2018 at ITI Tarsali, Vadodara.</b>			
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1.	Laxmi Das Hindocha Managing Director	Transpek Industries Ltd. Vadodara	Chairman
2.	S. A. Pandav RDD, Vadodara	DET Gujarat	Member/ Coordinator
3.	Nikunj Kumar R. Patel	Baroda, Dairy, Vadodara	Member
4.	Nirmal N. Patel	Baroda, Dairy, Vadodara	Member
5.	Birendra Kumar Manager (Production)	Vidya Dairy, Anand	Member
6.	Ajay M. Zala Dy. Manager (Dairy)	Vidya Dairy, Anand	Member
7.	M. G. Meghani OSD	KDCMPU Ltd., Anand	Member
8.	Mayank I. Patel Dy. Manager	KDCMPU Ltd., Anand	Member
9.	Hiren J. Purohit HR Officer	Laxmi Cukezone Pvt. Ltd., Anand	Member
10.	Harun Saiyad Store Incharge	Laxmi Cukezone Pvt. Ltd., Anand	Member
11.	R. S. Kate, Sales Head	R. K. Foods, Tarsali, Gujarat	Member
12.	Jitendra, Manager	Dungee Dum Ltd., Tarsali, Gujarat	Member
13.	Y. B. Joshi, Pricipal	ITI Khambat, Gujarat	Member

### **ABBREVIATIONS**

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities

