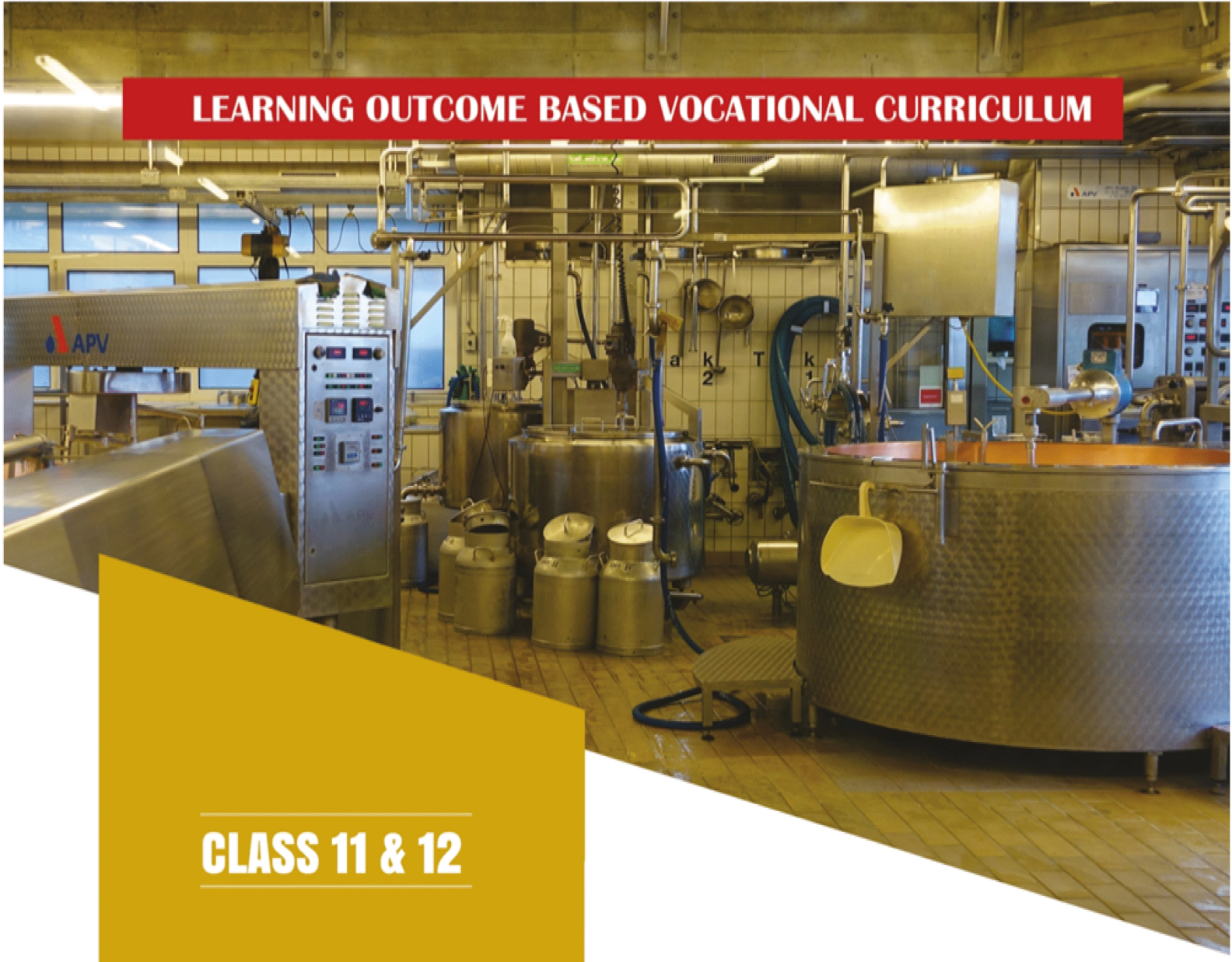
LEARNING OUTCOME BASED VOCATIONAL CURRICULUM



CLASS 11 & 12

SECTOR:

FOOD PROCESSING

SUB-SECTOR: DAIRY PRODUCTS

JOB ROLE

DAIRY PROCESSING EQUIPMENT OPERATOR

(QUALIFICATION PACK: REF. ID. FIC/Q2002)

State Council of Educational Research & Training (SCERT) Kerala
(Department of General Education, Government of Kerala)
Vidhya Bhavan, Poojappura, Thiruvananthapuram

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FOREWORD

A collaborative initiative for developing learning outcome based vocational curriculum and courseware aimed at integrating both vocational and general qualifications has been implemented by the State Council of Educational Research and Training (SCERT) Kerala and the PSSCIVE Bhopal. This is intended to open up pathways of career progression for students and the SCERT Kerala is developing curricula under the project as an integral part of Vocationalisation of Education under Samagra Shiksha, approved by the Government of Kerala. Decisive improvement in the teaching-learning process and working competencies through learning outcomes that have been judiciously embedded in the vocational subject is expected to be the major impact that will be brought about by the learning outcome based vocational curriculum.

It is a matter of great pleasure to introduce this learning outcome based vocational curriculum as part of the vocational training package for the job role of Dairy Processing Equipment Operator (FIC/Q2002). The curriculum has been developed for the higher secondary students of vocational education and is aligned to the National Occupation Standards (NOSs) of a job role identified and approved under the National Skill Qualification Framework (NSQF).

The key aim of the curriculum will be to provide children with employability and vocational skills that would in turn aid occupational mobility and lifelong learning. A major transformation in the teaching process is also aimed at, which will be brought about through interactive sessions in classrooms, practical activities in laboratories and workshops, projects, field visits, and professional experiences.

The curriculum has been meticulously developed and judiciously reviewed by a group of experts and their much-valued contributions are immensely acknowledged. The imminent utility of the curriculum will without doubt, be adjudged by the qualitative improvement that it brings about in teaching-learning. The feedback and suggestions on the content by the teachers and other stakeholders will be of immense value to us in bringing about further enhancement and augmentation to this document.

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ACKNOWLEDGEMENTS

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We are extremely thankful to Dr. RVG Menon, Chairperson, High Power Committee for the implementation of NSQF in Kerala, Dr.Sukesh Kumar, Former Principal, Government Engineering College Palakkad and Sri. G S Unnikrishnan Nair, Former Director State Agricultural Management and Extension Training Institute (SAMETI), Thiruvananthapuram for their mentorship in the process of developing this document. The contributions made by Dr. Vinay Swarup Mehrotra, Professor and Head, Curriculum Development and Evaluation Centre (CDEC), PSSCIVE Bhopal in development of the curriculum are duly acknowledged.

We are grateful to the experts for their earnest efforts and contributions in the development of this learning outcome based vocational curriculum. Their names are acknowledged in the list of contributors.

We are grateful to the Vocational Higher Secondary wing of the Directorate of General Education (DGE) Kerala for extending the support to develop this curriculum document on time by providing the service of its teaching staff.

1. COURSE OVERVIEW

COURSE TITLE: DAIRY PROCESSING EQUIPMENT OPERATOR

GENERAL OBJECTIVES

Dairy Processing Equipment Operator is an integral job profile in every dairy plant. Dairy processing equipment operator engages in operation and maintenance of dairy processing equipment .The main objective of dairy processing equipment Operator course is to create skilled personnel to carry out efficient running of the dairy plant as well as maintaining inventory in the dairy plant.

On successful completion of this course, the learners are expected to develop skills;

- to operate various dairy equipment in the dairy plant
- to maintain dairy processing equipment.
- to do analysis of milk and aware of various food safety standards.
- to maintain general safety practices in the dairy plant
- to perform documentation and record keeping in the dairy establishments.

COURSE OUTCOMES

On completion of the course, student should be able to;

- apply effective oral and written communication skills to interact with people and customers;
- identify the principal components of a computer system;
- demonstrate the basic skills of using computer;
- demonstrate self-management skills;
- demonstrate the ability to provide a self-analysis in context of entrepreneurial skills and abilities;
- demonstrate the knowledge of the importance of green skills in meeting the challenges of sustainable development and environment protection;
- identify the principal components of milk, standards of different classes of milk and present scenario;
- list the different types of tools, engineering materials used in dairy work area;
- demonstrate the general safety practices in the work area;
- identify various types of sanitary pipes and fittings; valves, mixing systems;
- demonstrate skill in operation and maintenance of all equipments and machineries used in milk and milk products processing area;
- identify minor repairs and faults in process machineries;
- demonstrate disposal of waste materials as per organizational standards and industry requirements;

- apply time management strategies and techniques in operating the processing equipment;
- maintain work area before and after processing;
- develop skills in preparing various detergents and sanitizers used in dairy plant;
- demonstrate documentation and record keeping in dairy industry;
- demonstrate operation and maintenance of Bulk Milk Cooler in co-operative society

COURSE REQUIREMENTS

The learner should have the basic knowledge of science.

COURSE DURATION: 600 hrs

Class 11	300 hrs
Class 12	300 hrs
Total	**600 hrs**

2. SCHEME OF UNITS

The unit-wise distribution of hours and scores for Class 11 is as follows:

CLASS 11			
	Units	**No. of Hours for Theory and Practical = 300**	**Max. Scores for Theory and Practical =100**
Part A	**Employability Skills**		
1.	Communication Skills – III	25	**10**
2.	Self-management Skills – III	25	
3.	Information and Communication Technology Skills – III	20	
4.	Entrepreneurial Skills – III	25	
5.	Green Skills – III	15	
	Total	**110**	**10**
Part B	**Vocational Skills**		
6.	Introduction to milk processing	10	
7.	General tools and safety practices in the work area	15	
8.	Introduction to milk processing equipment	100	
9.	Preparation and maintenance of work area	40	
	Total	**165**	**40**
Part C	**Practical Work**		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
	Total	**10**	**35**

Part D	**Project Work/Field Visit/ OJT**		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
	Total	**15**	**15**
	Grand Total	**300**	**100**

The unit-wise distribution of hours and scores for Class 12 is as follows:

CLASS 12			
	Units	**No. of Hours for Theory and Practical =300**	**Max. scores for Theory and Practical = 100**
Part A	**Employability Skills**		
1.	Communication Skills – IV	25	**10**
2.	Self-management Skills – IV	25	
3.	Information and Communication Technology Skills – IV	20	
4.	Entrepreneurial Skills – IV	25	
5.	Green Skills – IV	15	
	Total	**110**	**10**
Part B	**Vocational Skills**		
6.	Introduction to dairy products	25	
7.	Quality standards ,health and safety aspects in dairy and food industry	35	
8.	Introduction to dairy product processing equipment/ machines	55	
9.	Instrumentation in dairy industry	30	
10.	Documentation and Record keeping	20	
	Total	**165**	**40**
Part C	**Practical Work**		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
	Total	**10**	**35**
Part D	**Project Work/Field Visit/OJT**		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
	Total	**15**	**15**
	Grand Total	**300**	**100**

3. LEARNING OUTCOME BASED ACTIVITIES

Classroom, Laboratory/workshop and field are the key spots where teaching and learning take place. Classroom and laboratory-based teaching and learning facilitate knowledge creation whereas field visits open venues for free interaction with experts and also helps acquaint learners with various tools, materials, equipment procedures and operations in the workplace. While considering

these intensified ways of knowledge acquisition, emphasis should also be laid on the occupational safety, health and hygiene of the participants.

Classroom activities

Classroom activities are mainly interactive lecture sessions, followed by discussions and doubt clarifications. Classes are handled by trained vocational teachers and this is considered as an integral part of the course. The most attractive feature of the class is that the classes are in tune with the outcome-based curriculum. Teaching learning processes are well planned and implemented. Teaching learning materials such as audio-visual materials, colour slides, charts, diagrams, models, exhibits, handouts, on-line teaching materials etc., have been incorporated in accordance with the topic and this may help the teachers to impart the content in an effective manner.

Practical work in Laboratory / Workshop

Practical work is usually performed to enhance the skills of the learners which are indeed essential for them to become specialized technicians. Practical sessions may include hands on training, simulation training, role-play, case-based studies and exercises. Equipment and other appliances are available for use in abundance. Trained personnel teach and exercise specialized techniques. Practical classes involving laboratory/workshop are well planned with tools, equipment, materials and also other skill acquisition activities. Vocational teachers should submit the plan of laboratory/workshop work in advance to the head of the institution and get it sanctioned prior to use.

Field visits/ Educational Tour

Field visit is one of the ways and means of learning outside the classroom. It promotes knowledge acquisition by giving opportunity to learners to interact with renowned experts and to make observations of the activities performed by them. An observation check list may help the students to ensure the collection of required information and its analysis for further use. This may be developed with the help of vocational teachers who are in charge of outdoor learning activities. All the field visits are well planned by taking into consideration of the learning requirements, distance to travel, time, health and hygiene. The Principal and teachers should plan to implement at least three field visits within a year by making all necessary arrangements.

Virtual Field Visits, Expert Interactions and Practical Activities

With the rapid potentials offered by information technology in digital classrooms, the extent of virtual field visits, online expert interactions and online demonstrations cum practical activities can be worked out. It may be helpful amid the current Covid 19 pandemic scenario. A State level cluster of teachers and experts in the concerned subject can be pooled together for the purpose. The guidelines for such activities can be issued by the concerned SCERTs.

Suggested Topics For Expert Interaction

1. Scope and importance of milk processing
2. Assembling and Working of HTST pasteurizer
3. Packaging machines in dairy industry
4. Agitators, impellers and different mixing systems
5. CIP systems
6. Working of pumps used in dairy plants
7. Sanitary pipes and fittings in dairy industry
8. Preparation of various detergents and sanitizers used in dairy plants
9 Different tools used in dairy industry like wrenches, pliers,saws, cutters etc and their use
10. Waste disposal- working of ETP
11. Food safety standards at processing atplant-GMP,HACCP,FSSAI,ISO etc
12. Safety equipment – Plant & Personnel
13. Working of ice cream unit
14. Milk sterilisation unit.
15. Different measuring instruments in dairy industry
16. Automation in dairy industry.

4. ASSESSMENT AND CERTIFICATION

The National Skill Qualification Framework (NSQF) is based on outcomes rather than inputs referred by the National Occupation Standards (NOSs). Learning outcomes, as per the NSQF level descriptors, include the Process, Professional Knowledge, Professional Skills, Core Skills and Responsibility. Knowledge in the job of a learner shall be the basis of assessment. It would also be considered if the learning program undertaken by the learner has delivered the required output. Certification is based on required standards so that the learner and the employer could come to know about the competency attained in the vocational subject/ course. In order to make the assessment reliable, valid, flexible, convenient, cost effective, fair and transparent standardised assessment tools are to be used. Technology assisted assessment process is in vogue now.

Knowledge Assessment (Theory)

Knowledge Assessment usually includes two components – Internal Assessment and External Assessment. External assessment includes theory examination conducted by the concerned examination Boards. Tools for assessment contain components for testing the application of knowledge. Knowledge testing can be performed by making use of either objective or short answer type paper-based test. Source of the questions should be the content of the curriculum.

Written Test

A group, comprising of academicians, experts from existing vocational subject experts / teachers, subject experts from University/ College or from the industry prepare theory question paper for the vocational subjects. A panel of experts for question paper setting and conducting examination should be formed by the respective central / state boards. Written tests allow the learners to demonstrate that they have acquired the necessary knowledge and skill in the given topics.

The blue print for the question paper may be as follows:

Duration: 3 hrs **Maximum Scores: 50**

		No. of Questions			
	Typology of Question	**Very Short Answer (1 Score)**	**Short Answer (2 Scores)**	**Long Answer (3 Scores)**	**Scores**
1.	Remembering – (Knowledge based simple recall questions, to know specific facts, terms, concepts, principles, or theories; identify, define or recite, information)	**3**	**3**	**3**	**18**
2.	Understanding – (Comprehension – to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	**2**	**4**	**3**	**19**
3.	Application – (Use abstract information in concrete situation, to apply knowledge to new situations: Use given content to interpret a situation, private an example, or solve a problem)	**0**	**2**	**1**	**07**
4.	High Order Thinking Skills – (Analysis and Synthesis – Classify, compare, contrast, or differentiate between different pieces of information; Organize and/ or integrate unique pieces of information from a variety of sources)	**0**	**2**	**0**	**04**
5.	Evaluation – (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	**0**	**1**	**0**	**02**
	Total	**5x1=5**	**12x2=24**	**7x3=21**	**50 (24 questions)**

Skill Assessment (Practical)

Skill assessment should be done by considering the practical demonstration of skills by the candidate. It is assessed by making use of a competency checklist prepared by experts. The competency checklist should be developed as per the National Occupation Standards (NOSs). This should be in tune with the qualification pack for the Job Role to ensure necessary consistency in the quality of assessment across different sectors and institutions. As per the performance criteria defined in the National Occupation Standards, the students have to demonstrate their competencies in front of the examiners. Assessment will indicate whether they are competent or incompetent. The assessors assessing the skills of the students should possess enough industrial experience and should have undergone a rigorous training in assessment principles and practices. The Sector Skill Councils (SSCs) should ensure that the assessors are given the required training on the assessment of competencies.

The demonstration of knowledge and skill in performing a task of the learners, is the purpose of the practical examination. This include practical examination where hands on experience will be displayed and a viva voce. A team of two evaluators, one a subject teacher and the other an expert from the relevant industry certified by the relevant Board or SSCs concerned can conduct practical examination as well as viva voce.

Project Work

Project is an efficient strategy to assess the practical skills acquired along a certain timeline. Project is chosen and given to candidates only on the basis of their capabilities, because it needs specific skills. It is performed step by step and the first and foremost step is classroom discussion and selection of the topic for the project. After fixing the topic and objectives, the methodology of the project work should be decided during the classroom discussions. Monitoring and evaluation should be done at each stage. Proper feedback shall be provided to the learners for improvement and innovation. Field visits can be organized as part of the project work. The data collected may be used for presentations and report writing. Accuracy of the data is to be ensured. The entire project work is maintained as a practical work file or as student's portfolio.

Student Portfolio

It is a document that supports the candidate claim of competencies acquired as a part of the teaching learning process. The student portfolio is a compilation of project reports, articles, photos of products prepared by the student.

Viva Voce

Viva voce provides chance to each candidate to demonstrate communication skills and content knowledge. It is a way of obtaining feedback on the student's experience, learning, project work and field visit. Audio visual recording of the whole procedure can be done for future reference and documentation. A Board, including external examiners, is constituted as per the norms which in turn should be suitably adapted to the specific requirement of the vocational subjects.

The central/state examination board for secondary education and the respective Sector Skill Councils can certify the competencies of the learner upon the successful completion of the course.

5. UNIT CONTENTS

CLASS 11

Part A: Employability Skills

Sl.No.	Units	Duration (hrs)
1.	Communication Skills- III	25
2.	Self-management Skills – III	25
3.	Information and Communication Technology Skills - III	20
4.	Entrepreneurial Skills – III	25
5.	Green Skills – III	15
	Total	**110**

Unit 1: Communication Skill– III

Expected Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Duration (25 hrs)
1. Demonstrate knowledge of various methods of communication	• Methods of communication • Verbal • Non-verbal • Visual	• Writing pros and cons of written, verbal and non-verbal communication • Listing do's and don'ts for avoiding common body language mistakes	05
2. Identify specific communication styles	• Communication styles- assertive, aggressive, passive-aggressive, submissive, etc.	• Observing and sharing communication styles of friends, teachers and family members and adapting the best practices • Role plays on communication styles.	10
3. Demonstrate basic writing skills	• Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech	• Demonstration and practice of writing sentences and paragraphs on topics related to the subject	10

	• Articles • Construction of a Paragraph		
Total			**25**

Unit 2: Self-Management – III			
Expected Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**
1. Demonstrate impressive appearance and grooming	• Describe the importance of dressing appropriately, looking decent and positive body language • Describe the term grooming • Prepare a personal grooming checklist • Describe the techniques of self- exploration	• Demonstration of impressive appearance and groomed personality • Demonstration of the ability to self-explore	10
2. Demonstrate team work skills	• Describe the important factors that influence in team building • Describe factors influencing team work	• Group discussion on qualities of a good team • Group discussion on strategies that are adopted for team building and team work	10
3. Apply time management strategies and techniques	• Meaning and importance of time management – setting and prioritizing goals, creating a schedule, making lists of tasks, balancing work and leisure, using different optimization tools to break large tasks into smaller tasks.	• Game on time management • Checklist preparation • To-do-list preparation	05
Total			**25**

Unit 3: Information and Communication Technology– III			
Expected Learning Outcome	**Theory (08 hrs)**	**Practical (12 hrs)**	**Duration (20 hrs)**
1. Create a document on word processor	• Introduction to word processing. • Software packages for word processing. • Opening and exiting the word processor. • Creating a document	- Demonstration and practice of the following: • Listing the features of word processing • Listing the software packages for word processing	10

		• Opening and exit the word processor • Creating a document	
2. Edit, save and print a document in word processor	• Editing text • Wrapping and aligning the text • Font size, type and face • Header and Footer • Auto correct • Numbering and bullet • Creating table • Find and replace • Page numbering • Printing document • Saving a document in various formats	- Demonstration and practising the following: • Editing the text • Word wrapping and alignment • Changing font type, size and face • Inserting header and footer • Removing header and footer • Using autocorrect option • Insert page numbers and bullet • Save and print a document	10
Total			**20**

Unit 4: Entrepreneurial Skills – III			
Expected Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**
1. Describe the significance of entrepreneurial values and attitude	• Values in general and entrepreneurial values • Entrepreneurial value orientation with respect to innovativeness, independence, outstanding performance and respect for work	• Listing of entrepreneurial values by the students. • Group work on identification of entrepreneurial values and their roles after listing or reading 2-3 stories of successful entrepreneur • Exhibiting entrepreneurial values in Ice breaking, rapport building, group work and home assignments	10
2. Demonstrate the knowledge of attitudinal changes required to become an entrepreneur	• Attitudes in general and entrepreneurial attitudes • Using imagination/ intuition • Tendency to take moderate risk • Enjoying freedom of	• Preparing a list of factors that influence attitude in general and entrepreneurial attitude • Demonstrating and	15

	expression and action • Looking for economic opportunities • Believing that we can change the environment • Analyzing situation and planning action • Involving in activity	identifying own entrepreneurial attitudes during the following micro lab activities like thematic appreciation test • Preparing a short write-up on "who am I" • Take up a product and suggest how its features can be improved • Group activity for suggesting brand names, names of enterprises, etc.	
Total			**25**

Unit 5: Green Skills – III			
Expected Learning Outcome	**Theory (07 hrs)**	**Practical (08 hrs)**	**Duration (15 hrs)**
1. Describe importance of main sector of green economy	• Main sectors of green economy- E-waste management, green transportation, renewal energy, green construction, water management • Policy initiatives for greening economy in India	• Preparing a poster on any one of the sectors of green economy • Writing a two-page essay on important initiatives taken in India for promoting green economy	08
2. Describe the major green Sectors/Areas and the role of various stakeholder in green economy	• Stakeholders in green economy • Role of government and private agencies in greening cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries	• Preparing posters on green Sectors/Areas: cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries	07
Total			**15**

PART B: VOCATIONAL SKILLS

Sl.No.	Units	Duration (hrs)
1	Introduction to milk processing	10
2	General tools and safety practices in the work area	15
3	Introduction to milk processing equipment	100
4	Preparation and maintenance of work area	40
	Total	**165**

Unit 1: Introduction to milk processing			
Expected Learning Outcome	**Theory (6 hrs)**	**Practical (4 hrs)**	**Duration (10 hrs)**
1. Identify different classes of milk	• Definition of milk • Composition of milk. • Standards of different classes of milk	• Identify various types of milk available in market	6
2. Explain milk processing methods and its importance in present scenario	• Explain concept of milk production and present status in India and Kerala		4
Total			**10**

Unit 2: General tools and safety practices in the work area			
Expected Learning Outcome	**Theory (7 hrs)**	**Practical (8 hrs)**	**Duration (15 hrs)**
1. List out different types of tools used in dairy work area.	• Familiarize with the various tools used in dairy industry like wrenches, pliers, saws, cutters etc.	• Identification and use of various tools.	7
2. List the general safety practices in the work area	• Familiarize with the various safety equipment used in the work area	• Safety equipment identification, function and usage.	8
Total			**15**

Unit 3: Introduction to milk processing equipment			
Expected Learning Outcome	**Theory (45 hrs)**	**Practical (55 hrs)**	**Duration (100 hrs)**
1. Develop an awareness about different types of engineering materials used in dairy Industry	• Engineering materials used in Dairy Industry: Stainless steel and its types, Plastics, Gaskets, Glass	• Familiarize with the various engineering materials used in dairy industry.	8
2. Identify various types of sanitary pipes and fittings.	• Pipes and Fittings used in dairy industry	• Identify the different types of pipes (colour	8

		codes) and fittings.	
3. Explain operation of different types of valves used in dairy plant.	• Sanitary valves	• Identify the various valves and its functions	8
4. Demonstrate working of pumps used in dairy plant	• Pumps used in dairy industry: • Classification - reciprocating, centrifugal pump. • Pressure Variation • Work efficiency	1. Working demonstration of various pumps	8
5. Demonstrate working of various equipment at Raw Milk Reception Dock	• Can washers, Tipping bar, Weighing bowl, Dump tank, Flow meters.	• List and identify various parts of the equipment. • Process parameters study	6
6. Demonstrate milk pasteurization	• pasteurization- objectives • Types of pasteurization .	• Schematic diagram of HTST pasteurization	7
7. Develop skill in operation of various equipment in milk processing section	Operation of the following equipment: • Tanks - Silos; Storage tanks • Milk Filters and types • Clarifiers; tri processors; cream separators; • Bactofuge • Homogenizers -Single stage; double stage; Aseptic homogenizers • Pasteurizers - Batch type; Flash and Continuous. • Heat exchangers - jacketed kettles, Plate heat exchangers, Tube in tubular heat exchangers; Shell and tube heat exchangers. • Flow diversion valve • Pasteurizer controls • Basic concept about milk sterilization	• List and identify various parts of the equipment. • Process parameters study in detail like temperature, pressure, material used, time, speed, velocity etc. • Perform pre check, assembling and operation of equipment. • Calculate the process time of machines (study the effective utilization of machineries and manpower).	40
8. Identify different Mixing systems	• Agitators and impeller types • Mixing pumps	• List and identify different types of impellers in agitators	5

		• List the processing parameters.	
9. Identify different types of Packing machines and perform its operation	• Packing machines - Pouch filling machine, Bottle filling machine and Cup filling system • Blow moulding machines • Aseptic PET bottle filling machine • Aseptic bulk handling system • Capping system and machines	• List the parts of packingmachines • Operate different types of packing machine	10
Total			**100**

Unit 4: Preparation and maintenance of work area			
Expected Learning Outcome	**Theory (15 hrs)**	**Practical (25 hrs)**	**Duration (40 hrs)**
1. Explain types of deposits/soils in dairy machineries and identify suitable cleaning agents.	• Different types of deposits/soils in various processing equipment. • Selection of suitable cleaning agent and de-soiling process.		**5**
2. Develop skills in preparing various detergents and sanitizers used in dairy plant	• List various detergents and sanitizers commonly used and their optimum strength/concentrations	• Demonstrate preparation of various detergents and sanitizers	5
3. Prepare and maintain work area and process machineries for processing	• List the methods of cleaning and sanitization: Manual washing, Mechanical washing, Cleaning in Place(CIP) and Sanitisation of dairy equipment • Pest control	• Visit to a dairy plant to study different cleaning and sanitisation procedures/methods and perform a cleaning schedule	7
4. Demonstrate disposal of waste materials as per organizational standards and industry requirements	• Segregation of waste • Effluent treatment plant (ETP)	• Visit to a dairy plant and prepare report	**6**

5. Explain different typesof maintenance procedures	• Preventiveand corrective maintenance of dairy equipment	• Demonstration	**8**
6. Identify minor repairs and faults in process machineries	• Place the necessary tools required for process • Study minor repairs/faults of all machines (like pasteuriser. homogenizer, cream separator, packaging machines etc.)	• Visit to dairy plant to study and attend minor repairs/ faults of all machines	**9**
Total			**40**

CLASS 12

Part A: Employability Skills

Sl.No.	Units	Duration (hrs)
1.	Communication Skills- IV	25
2.	Self-management Skills - IV	25
3.	Information and Communication Technology Skills - IV	20
4.	Entrepreneurial Skills - IV	25
5.	Green Skills - IV	15
	Total	**110**

Unit 1: Communication Skills - IV			
Expected Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**
1. Describe the steps to active listening skills	• Importance of active listening at workplace • Steps to active listening	• Demonstration of the key aspects of becoming active listener • Preparing posters of steps for active listening	10
2. Demonstrate basic writing skills	➢ Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph	• Demonstration and practice of writing sentences and paragraphs on topics related to the subject	15
Total			**25**

Unit 2: Self-Management Skills – IV			
Expected Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**
1. Describe the various factors influencing self-motivation	• Finding and listing motives (needs and desires); • Finding sources of motivation and inspiration (music, books, activities);expansive thoughts; living fully in the present moment; dreaming big	• Group discussion on identifying needs and desire • Discussion on sources of motivation and inspiration	**10**
2. Describe the basic personality traits, types and disorders	• Describe the meaning of personality • Describe how personality influence others • Describe basic personality traits • Describe common personality disorders-paranoid, antisocial, schizoid, borderline, narcissistic, avoidant, dependent and obsessive	• Demonstrate the knowledge of different personality types	**15**
Total			**25**

Unit 3: Information and Communication Technology Skills– IV			
Expected Learning Outcome	**Theory (06 hrs)**	**Practical (14 hrs)**	**Duration (20 hrs)**
1. Perform tabulation using spreadsheet application	• Introduction to spreadsheet application • Spreadsheet applications • Creating a new worksheet • Opening workbook and entering text • Resizing fonts and styles • Copying and moving • Filter and sorting • Formulas and functions • Password protection. • Printing a spreadsheet. • Saving a spreadsheet in various formats.	➢ Demonstration and practice on the following: • Introduction to the spreadsheet application • Listing the spreadsheet applications • Creating a new worksheet • Opening the workbook and enter text • Resizing fonts and styles • Copying and move the cell data • Sorting and Filter the data • Applying elementary formulas and functions	**10**

		• Protecting the spreadsheet with password • Printing a spreadsheet • Saving the spreadsheet in various formats.	
2. Prepare presentation using presentation application	• Introduction to presentation • Software packages for presentation • Creating a new presentation • Adding a slide • Deleting a slide • Entering and editing text • Formatting text • Inserting clipart and images • Slide layout • Saving a presentation • Printing a presentation document.	➢ Demonstration and practice on the following: • Listing the software packages for presentation • Explaining the features of presentation • Creating a new presentation • Adding a slide to presentation. • Deleting a slide • Entering and edit text • Formatting text • Inserting clipart and images • Sliding layout • Saving a presentation • Printing a presentation document	**10**
Total			**20**

Unit 4: Entrepreneurial Skills – IV			
Expected Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**
1. Identify the general and entrepreneurial behavioural competencies	• Barriers to becoming entrepreneur • Behavioural and entrepreneurial competencies – adaptability/decisiveness,initiative/perseverance, interpersonal skills, organizational skills, stress management, valuing service and diversity	• Administering self-rating questionnaire and score responses on each of the competencies • Collect small story/ anecdote of prominent successful entrepreneurs • Identify entrepreneurial competencies reflected in each story and connect it to the definition of behavioural competencies • Preparation of competencies profile of students	**10**

2. Demonstrate the knowledge of self-assessment of behavioural competencies	• Entrepreneurial competencies in particular: self - confidence, initiative, seeing and acting on opportunities, concern for quality, goal setting and risk taking, problem solving and creativity, systematic planning and efficiency, information seeking, persistence, influencing and negotiating, team building	• Games and exercises on changing entrepreneurial behaviour and development of competencies for enhancing self-confidence, problem solving, goal setting, information seeking, team building and creativity	**15**
Total			**25**

Unit 5: Green Skills – IV			
Expected Learning Outcome	**Theory (05 hrs)**	**Practical (10 hrs)**	**Duration (15 hrs)**
1. Identify the role and importance of green jobs in different sectors	• Role of green jobs in toxin-free homes, • Green organic gardening, public transport and energy conservation, • Green jobs in water conservation • Green jobs in solar and wind power, waste reduction, reuse and recycling of wastes, • Green jobs in green tourism • Green jobs in building and construction • Green jobs in appropriate technology • Role of green jobs in Improving energy and raw materials use • Role of green jobs in limiting greenhouse gas emissions • Role of green jobs minimizing waste and pollution • Role of green jobs in protecting and restoring ecosystems • Role of green jobs in support adaptation to the effects of climate change	▪ Listing of green jobs and preparation of posters on green job profiles • Prepare posters on green jobs.	**15**
Total			**15**

PART B–VOCATIONAL SKILLS

Sl.No.	Units	Duration (hrs)
1	Introduction to dairy products	25
2	Quality standards, health and safety aspects in dairy and food industry.	35
3	Introduction to dairy products processing equipment/machines	55
4	Instrumentation in dairy industry	30
5	Documentation and record keeping	20
	Total	**165**

Unit 1:Introduction to dairy products			
Expected Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**
1. List the different types of milk products and their method of production.	• List the different classes of milk products • Production chart/ Process flow chart of milk products.	• Preparation of milk products	25
Total			**25**

Unit 2: Quality standards, health and safety aspects in dairy and food industry			
Expected Learning Outcome	**Theory (10 hrs)**	**Practical (25 hrs)**	**Duration (35 hrs)**
1. Demonstrate different quality control tests of milk.	• Platform tests • estimation of fat and SNF • Estimation of acidity • Methylene Blue Reduction Test.(MBRT) • adulterants in milk-water, sugar, starch etc. • Neutralisers in milk • alkaline phosphatase test.	▪ Perform all these tests.	15
2. List the food safety standards to be followed	• Factors affecting dairy quality • National standards for hygienic milk production • Processing methods standards (GMP, HACCP, ISO,FSSAI, etc.) • Packing standards • Labelling standards • Storage and transportation standards	• Video show on food safety	5

3. Describe the personal hygiene to be maintained in food handling systems	• Personal hygiene • Hygienic procedures to be followed in industry	• Enlist personal hygiene procedures • collect photographs of do's and don'ts to be followed in a food processing plant. • demonstrate steps of hand washing and enlist when the hands are to be washed.	5
4. List and describe safety equipment	• Safety Equipment • Importance and operation of safety equipment	• Enlist safety equipment • Operate the safety equipment	10
Total			**35**

Unit 3: Introduction to dairy products processing equipment/machines			
Expected Learning Outcome	**Theory (15 hrs)**	**Practical (40 hrs)**	**Duration (55 hrs)**
1. Develop skill in operation of various equipment in milk products manufacturing.	Operation of the following equipment: • Khoa making machine • Paneer making equipment • Ghee making equipment • Butter making machine • Ice cream making machine • Traditional products making equipment (Gulabjamun, Rosogolla etc.) • Milk sterilization unit	• List and identify various parts of the equipment. • Study of process parameters like temperature, pressure, material used, time, speed, velocity etc. • Perform pre check, assembling and operation of equipment. • Calculate the process time of machines (study the effective utilization of machineries and manpower). • Estimate the performance of the processing equipment. • Conduct maintenance of the equipment. • Identify minor repairs and faults in process machineries	55
Total			**55**

Unit 4: Instrumentation in dairy industry			
Expected Learning Outcome	**Theory (12 hrs)**	**Practical (18 hrs)**	**Duration (30 hrs)**
1. List and describe the different types of measuring instruments in dairy industry.	• Different types of measuring devices used in dairy industry (temperature, pressure, flow, speed, torque, vibration, level, pH, conductivity etc.). • Working function of instruments/ devices.	• Video of working of various measuring devices. • Identify the measuring devices and function.	10
2. Develop skill in operating measuring devices.	• Operation of the measuring devices	• Operate the measuring device. • Visit to dairy plant to record and analyze the reading of the measuring devices.	15
3. Describe the overview of the automation system adopted in dairy industry	• Introduction to PLC and SCADA (overview)	• Visit to dairy plant to understand the function of PLC and SCADA.	5
Total			**30**

Unit 5: Documentation and Record keeping			
Expected Learning Outcome	**Theory (10 hrs)**	**Practical (10hrs)**	**Duration (20hrs)**
1. Keep record of raw materials and packaging materials	• Record Keeping • Documentation of raw material and packaging material • Requisitioning raw material for daily production • Enterprise resource planning (ERP)	• Visit to any dairy industry/ audio visual demonstration of record keeping • Create an inventory management of raw materials and packaging materials such as name of raw material, type and variety, vendor/supplier details, quantity, receiving date/ date of manufacture, expiry date, conditions etc. as per organization	**10**

		standards.	
2. Assess the details to be documented inproduction schedule and process chart	• Maintaining records of production schedule • Maintaining records of production process	• Demonstration of record maintenance process at production schedule and process stages	**5**
3. Assess the details to be maintained and documented at finished product stages	• Record maintenance of finished products • Using ERP for finished product	• Demonstrate the record maintenance process of finished product.	**5**
Total			**20**

6. ORGANISATION OF FIELD VISITS/ON-THE-JOB TRAINING

In a year, at least 4 dairy visits/educational tours should be organised for the students to expose them to the activities in the workplace. Teachers and students should visit dairy plant to observe and practice various aspects of operation of industry. During the visit, students should obtain the following information from the operator or the supervisor of the Dairy Plant:

- Milk reception/RMRD
- Different equipment in dairy plant
- Working of HTST pasteurizer
- Packaging of milk
- Storage of milk.
- Quality control tests of milk and milk products
- Preparation of milk products.
- Boiler section.
- Refrigeration section.
- Effluent treatment plant.
- CIP cleaning/can washing/crate washing

On-the-job training of at least 80 hours is to be organised by the institution to provide hands-on training to the students.

7. LIST OF EQUIPMENT AND MATERIALS

The list given below is suggestive and an exhaustive list should be prepared by the vocational teacher. Only basic tools, equipment and accessories should be procured by the Institution so

that the routine tasks can be performed by the students regularly for practice and acquiring adequate practical experience.

- pH Meter
- Digital electronic weighing balance
- Milko tester
- Mixer Grinder
- Gerber's centrifuge electrically operated
- Hot water bath
- Hot air oven -small size
- Desiccators small size
- Laminar air flow system
- Incubator
- Oil immersion microscope
- Colony counter
- Precision balance 0.1 to 300g
- Autoclave
- Refrigerator (double door)
- LPG Gas stove with two burners
- Hand Sealing machine
- LPG Gas Stove (Large)
- Deep Freezer (Double door) – Chest Mounted–
- Digital Thermometer
- Milk Sampling Dipper
- Milk plunger for can
- Duplex filter for milk
- Lab model of pasteurizer
- Models of 3 way and 2 way valves
- Cream butyrometer
- Skim milk butyrometer
- Gerber's butyrometer
- Zeal Lactometer

8. LIST OF CONTRIBUTORS

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