



National Vocational Qualification
CURRICULUM OF FOOD TECHNOLOGY

Level 5

(Food Supervisor/Lab Technician/Operator)

National Vocational and Technical Training Commission
Islamabad

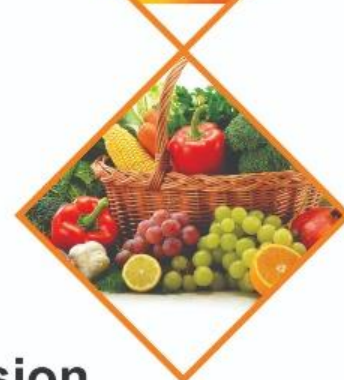
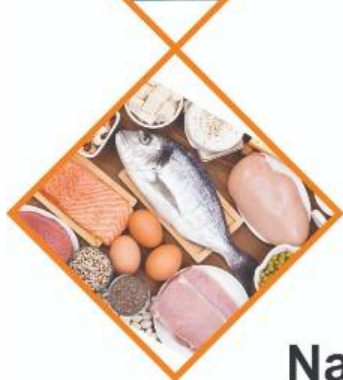


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1. INTRODUCTION

The agriculture sector is playing pivotal role to maintain the economy of the Pakistan where large number of individuals are directly or indirectly related to this sector to earn their livelihood. Pakistan has been bestowed with enormous climatic conditions conducive for producing multiple agricultural crops. However, much of the food produced is wasted due to negligence and lack of processing facilities. Alongside, there is always a huge need for food preservation and processing units capable of producing and ensuring availability of safe food for all necessary to maintain food security in the country. Hence, this course is specifically designed to develop basic to advanced skills and knowledge of the personnel related to Food Technology with special emphasis on requirements of the food industries with respect to safety and quality of the food products. The step by step training of the students in this course ensures polishing their skills to adapt and perform in the multidisciplinary environment of the food industries with variable food processing operations. The students are encouraged to implement their theoretical knowledge to wide range of food handling and processing environments such as raw material procurement, processing, storage, packaging and transportation while managing the quality and safety in the food systems. Furthermore, the students are introduced with new skills in a stepwise manner to increase their troubleshooting competencies in changing food operations. Notably, students are stimulated to polish their entrepreneurial skills and explore new horizons of the food processing industry.

To improve the quality and relevancy of this training program, National Vocational & Technical Training Commission via Qualification Development Committee (QDC) developed National Competency Standards Level 5 for Food Technology. The learning outcomes through this curriculum provide enough grounds to enrich the food industry with demand-driven trained personnel in line with the latest industrial needs. Furthermore, this curriculum can be implemented in different sectorial pathways with flexibility in both public and private sector institutes.

2. PURPOSE OF THE TRAINING PROGRAMME

The purpose of this qualification is to give the trainee a thorough understanding of Food Technology in the industry with effective quality control and safety of the food products. Food Technology operations are diversified and continuously subject to various changes. Therefore, it is important to emphasize on a multidisciplinary approach to meet the requirements of the industry and cope the encountered challenges in the food sector. Upon successful completion of this course the trainees will be aware of:

- The core elements of food processing and preservation techniques
- The chemistry underlying the properties and reactions of various food components
- The principles behind analytical techniques associated with food
- The laboratory techniques common to basic and applied food chemistry
- The basic principles and practices of hygiene and sanitation in food processing operations
- Applying the principles of food science to assure the quality and safety of food products.
- Waste management in food industries
- Providing supervision and working effectively with others in a variety of situations and dealing with individual and/or group conflict.

3. Overall objectives of training course

The primary objective of this training program is to provide the trainees with up-to-date knowledge and skills required by the food sector in a comprehensive way to cope the challenges of the food industries. After qualifying the course (Level 5), the students will be able to get job in the food industries and able to perform as entrepreneurs. The contents of the course are specifically designed in such a way that it covers all the major food sectors of Pakistan.

The overall objectives of developing this qualification are to:

- Improve the overall quality of training delivery and setting national benchmarks for training of Food Technology (Level 5) in the country
- Provide flexible and progressive learning opportunity for trainees to receive relevant and up-to-date skills of food industry
- Provide basis for competency-based assessment which is recognized and accepted by employers in modern days
- Establish a standardized and sustainable training in consultation with the food industry.

4. Curriculum Validation Committee

The following members participated in the qualifications validation meeting from February 7-11, 2022 at Pakistan Industrial Technical Assistance Center (PITAC), Lahore:

Sr.	Name	Designation
1.	Mr. Muhammad Aasim	Convener/Assistant Director, NAVTTC Coordinator
2.	Mr. Muhammad Nasir Khan	DACUM Facilitator, Ex-Deputy Director, SS&C Wing, NAVTTC
3.	Mr. Naeem-ur-Rehman Zafar	Deputy Manager Technical Application, AB Mauri Pakistan Pvt. Ltd. (Industry)
4.	Dr. Shinawar Waseem Ali	Ex-Quality Assurance Officer K&N Pakistan Associate Professor, Institute of Agricultural Sciences, University of the Punjab, Lahore
5.	Mr. Muhammad Ahmad	Manager Projects LabOnline Bizware (Private) Limited (Industry)
6.	Mr. Mubeen Arshad Awan	Quality Assurance Head, YUM Group (Industry) Former Director PFA
7.	Mr. Hafiz Rehan Nadeem	Secretary General (NAFS), National Alliance for Safe Food, Pakistan
8.	Dr. Muhammad Ajmal	Representative P-TEVTA HOD, Food Technology, Govt. College of Technology, Sahiwal
9.	Dr. Tabussam Tufail	Assistant Professor, University of Lahore
10.	Dr. Ihtisham-UI-Haq	Assistant Professor, Kauser Abdulla Malik School of Life Science, Forman Christian College (A Chartered University), Lahore
11.	Mr. Muhammad Abdul Aziz	Ex-Manager, Munchies Food, Islamabad Ex-Manager, Dominos, Islamabad
12.	Dr. Sumaira Maqsood	Assistant Professor Entomology, Institute of Agricultural Sciences, University of the Punjab, Lahore
13.	Ms. Samina Kulsoom	Representative S-TEVTA GCT Girls, Karimabad, Karachi
14.	Mr. Engr. Kifayatullah Khan	Representative B-TEVTA HOD Food Technology, Govt. Polytechnic Institute, Khanosia
15.	Mr. Shaukat Ali Rana	Representative PBTE Deputy Controller Examination

5. Competencies to be gained after completion of course

After completing this course, the students will be capable of performing different food processing operations decently in the food industries. The below listed competencies imprinted by this training program are quite prominent to the students' profile to enhance their employability in their career in food sector:

- Knowledge and concepts of processing operations in food industry
- Creative thinking and troubleshooting skills in food manufacturing
- Potential to translate theoretical knowledge into practice
- Identify and explore potential areas of opportunities in food sector
- Develop strategies to maintain quality and safety of food products
- Time management, working in teams and conflict handling among co-workers
- Safe and secure use of workplace tools, techniques and materials at worksites
- Digital documentation and effective communication skills
- Working in commercial setups and meeting the timelines

6. Job opportunities available immediately and in the future

The successful pass outs of this course may avail entrepreneurial opportunities and/or fetch job/employment in food sectors as

- Food Supervisor/ Lab Technician/ Operator (Level-V)

7. Trainee Entry Level:

- Matric science or equivalent with Level 4 qualified

8. Minimum Qualification of Trainer

- BS Food Science & Technology / DAE (Food Technology/Food Processing & Preservation) with 2-5 years of professional experience

9. Recommended trainer: trainee ratio

- The recommended trainer and trainee ratio is 1:24 per class

10. Medium of Instruction:

- Urdu, English or regional Language

11. Duration of Course (Total time, theory & practical)

Module #	Title	Theory Total (Hours)	Practical Total (Hours)	Total (Hours)	Credit hours
1.	Use Food Grade Packaging Material	36	54	90	09
2.	Perform Food Microbiology Tests	40	60	100	10
3.	Comply Quality Standards	40	60	100	10
4.	Implement Quality Management System	40	60	100	10
5.	Ensure Compliance of Food Safety System	40	60	100	10
6.	Monitor Freezing Process	32	48	80	08
7.	Apply Meat Curing and Smoking	40	60	100	10
8.	Prepare Different Types of Cheese	40	60	100	10
9.	Prepare Sugar	32	48	80	08
10.	Prepare Extruded Products	32	48	80	08
11.	Produce Confections	32	48	80	08
12.	Ensure Quality Control in Food Industry	36	54	90	09
13.	Entrepreneurship skills	30	70	100	10
Total hours		480	720	1200	120

SUMMARY OF COMPETENCY STANDARDS

The proposed curriculum is composed of 12 modules that will be covered in 1200 hrs. It is proposed that the course may be delivered in one year period. The distribution of contact hours (practical & theory) is given below:

- **Theory:** (40%) **Practical** (60%)
- **Theory:** 480 hours
- **Practical:** 720 hours

12. SUMMARY – OVERVIEW OF THE CURRICULUM

Module Title	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 01. Use Food Grade Packaging Material	LU1. Receive food packaging LU2. Test packaging material LU3. Perform PET bottles making LU4. Perform vacuum packing	36	54	90
Module 02. Perform Food Microbiological Tests	LU1. Conduct product Sampling LU2. Prepare stock and working solution LU3. Prepare culture media LU4. Assess cleaning efficiency LU5. Count colonies LU6. Inoculate and incubate microorganism on growth medium LU7. Calculate Total plate count	40	60	100
Module 03. Comply Quality Standards	LU1. Perform Receiving of Raw and Packaging Material LU2. Perform Batch Making operations LU3. Perform Sizing, Wrapping, and Packing Operations. LU4. Monitor Quality standards LU5. Apply Basic Mathematical Calculations	40	60	100
Module 04. Implement Quality Management System	LU1. Monitor Quality in Work area LU2. Contribute to continual improvement LU3. Participate in Internal Audits LU4. Implement food quality policy LU5. Maintain food quality records	40	60	100

Module 05. Ensure Compliance Of Food Safety System	LU1. Monitor food safety system LU2. Perform work according to the Food Safety System LU3. Apply HACCP principles in food production LU4. Participate in internal audit procedures	40	60	100
Module 06. Monitor Freezing Process	LU1. Prepare food products for freezing LU2. Monitor the freezing process LU3. Record information	32	48	80
Module 07. Apply Meat Curing and Smoking	LU1. Prepare, operate and clean processing equipment used for curing LU2. Prepare meat and ingredients LU3. Prepare brines LU4. Process and store the product LU5. Prepare meat and ingredients for smoking LU6. Smoke the meat products LU7. Chill the meat products	40	60	100
Module 08. Prepare Different Types Of Cheese	LU1. Check/analyze quality of raw milk LU2. Pasteurization of milk LU3. Inoculate culture LU4. Perform addition of rennet LU5. Monitor curd production and cutting process LU6. Operate pressing and molding machine LU7. Monitor pressing and moulding process LU8. Apply salting of cheese LU9. Ensure ripening of cheese LU10. Pack and store cheese	40	60	100
Module 09. Prepare Sugar	LU1. Check juice extraction process LU2. Monitor clarification and evaporation LU3. Perform crystallization LU4. Dry and pack sugar	32	48	80
Module 10. Prepare Extruded Products	LU1. Prepare extrusion ingredients LU2. Mix extrusion ingredients LU3. Perform extrusion LU4. Perform Frying LU5. Perform Drying LU6. Pack and store Extruded products	32	48	80
Module 11. Produce Confections	LU1. Receive and store raw materials as per manufacturing order	32	48	80

	LU2. Mix ingredients as per standard recipe LU3. Perform cooking of batch LU4. Perform rolling and moulding LU5. Prepare chocolate confection LU6. Prepare gums LU7. Perform wrapping and packaging			
Module 12. Ensure Quality Control in Food Industry	LU1. Check the quality of raw material LU2. Check Lab testing equipment LU3. Prepare product according to specifications LU4. Perform Sensory evaluation of the product LU5. Carry out Preventive measures LU6. Check the quality of the final product	36	54	90

Module 01: Use Food Grade Packaging Material

Objective: After completing this module, the learner will be capable to identify the quality of different packaging material as per standard specifications. Trainee will be able to perform different tests for the quality assurance of the packaging material. The trainees will get familiar with coding, labeling, blowing and vacuum sealing machines as per operational instructions.

Duration:	Total hours	90	Practical	54	Theory	36
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Receive food packaging	<ul style="list-style-type: none"> Inspect the incoming packaging material as per specification Verify labeled contents as per manufacturing order Operate date coding machine Ensure packaged products meet set requirements Ensure tertiary packaging for bulk handling for warehouses Monitor storage & shipment/transportation Ensure the protection of finished product from environmental factors 	<ul style="list-style-type: none"> Describe importance of inspection of packaging material Explain characteristics of a good food packaging material Explain the importance of packing of food product Enlist types of packaging material used in food Enlist types of packaging Explain environmental factors (temp & humidity) and quality of packaging material that effect food quality, food storage and packaging Demonstrate labeling and date coding machine 	10 hour Theory 12 hour Practical Total: 22 hours	Packaging material, Labeling machine, Date coding machine, Marker, Pen, Log book, Safety shoes, Helmet, Mask, Gloves, Goggles, Lab coat	Class Room and Workplace/ Lab
LU2. Test packaging	<ul style="list-style-type: none"> Perform physical testing of 	<ul style="list-style-type: none"> Describe the types 	10 hour	Packaging	Class

material	<p>packaging material</p> <ul style="list-style-type: none"> • Perform chemical testing of packaging material • Perform microbiological testing of packaging material 	<p>(physical, chemical & microbiological) tests for the quality assurance of the packaging material</p> <ul style="list-style-type: none"> • Demonstrate different tests for packaging material • Explain precautionary measure for handling of chemical and glass apparatus 	<p>Theory</p> <p>16 hour Practical</p> <p>Total: 26 hours</p>	<p>material,</p> <p>First aid box,</p> <p>Pen, Log book,</p> <p>glass cylinder,</p> <p>Glass Pipette,</p> <p>Conical Flask,</p>	<p>Room and Workplace/ Lab</p>
LU3. Perform PET bottles making	<ul style="list-style-type: none"> • Prepare preform • Operate blowing machine • Ensure bottle quality against specifications 	<ul style="list-style-type: none"> • Explain importance of preform • Demonstrate the working of blowing machine • Define standard specifications (Vacuum leak, Torque force, top load limit) for the quality check of bottles • Explain advantage of using PET bottles 	<p>08 hour Theory</p> <p>10 hour Practical</p> <p>Total: 18hours</p>	<p>PET bottles,</p> <p>Preform tool,</p> <p>Blowing machine</p>	<p>Class Room and workplace/ Lab</p>
LU4. Perform vacuum packing	<ul style="list-style-type: none"> • Perform the vacuum packing method • Analyze plastic film package • Ensure air removal from the package before sealing • Apply Package sealing • Ensure the replacement of internal oxygen with nitrogen gas 	<ul style="list-style-type: none"> • Enlist uses of plastic film package • Describe importance of vacuum packaging • Demonstrate importance of vacuum packing and sealing • Describe reasons to replace 	<p>08 hours Theory</p> <p>18hour Practical</p> <p>Total: 26 hours</p>	<p>Vacuum packing machine,</p> <p>Plastic film,</p> <p>Sealing machine,</p> <p>Shrink wrap,</p>	<p>Class Room and workplace/ Lab</p>

		internal oxygen with nitrogen gas		Marker,	
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Module 02: Perform Food Microbiology Tests

Objective: After completing this module, the trainees will learn the skills and knowledge required to demonstrate microbiological examination of the food product. The learner will be capable to identify the contaminants and different types of microbes involved in food spoilage. The trainees will learn aseptic techniques to improve the cleaning efficiency of the food processing and preservation units according to guidelines.

Duration:	Total hours	100	Practical	60	Theory	40
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Conduct product Sampling	<ul style="list-style-type: none"> Collect sample as per product category Analyze sample size and integrity of the container Ensure labelling and sampling Ensure storage of sample as per Standard Operating Procedures (SOPs) 	<ul style="list-style-type: none"> Describe environmental conditions (Temperature & humidity) required to store sample Explain the importance of sample size and container integrity check for safe food Describe importance of sample labeling and storage Explain causes of food spoilage Describe precautions to control spread of microorganisms Demonstrate different microbiological sampling techniques 	4hour Theory 6 hour Practical Total: 10 hours	Sample with container, Scale, Marker, Pen, Log book Mask, Gloves, Lab coat	Class Room and Workplace/ Lab
LU2. Prepare stock and working solution	<ul style="list-style-type: none"> Make solutions of required concentration Make different dilutions to make a working solution 	<ul style="list-style-type: none"> Describe difference between stock and working solution 	4 hour Theory 09 hour	Weighing balance, pH meter,	Class Room and Workplace/ Lab

		<ul style="list-style-type: none"> • Explain importance of stock solution • Demonstrate handling of hazardous chemicals 	Practical Total: 13 hours	Autoclave, Micropipette First aid box, Glass beaker, Glass Pipette, Test Tubes, Test tube rack,	
LU3. Prepare culture media	<ul style="list-style-type: none"> • Prepare agar culture medium • Prepare broth culture medium 	<ul style="list-style-type: none"> • Differentiate between agar and media • Explain temperature and pressure requirement for sterilization of media • Describe importance of sterilization of glass apparatus and growth media • Explain principle of autoclave • Demonstrate culture preparation techniques. • Demonstrate working of autoclave. 	4 hour Theory 09 hour Practical Total: 13 hours	Weighing balance, pH meter, Autoclave, Micropipette First aid box, Glass beaker, Glass cylinder, Glass Pipette, Conical Flask, Media bottles, Test Tubes, Test tube	Class Room and workplace/ Lab

				rack, Spatula,	
LU4. Assess cleaning efficiency	<ul style="list-style-type: none"> • Perform Swab Test • Perform Dilution Test 	<ul style="list-style-type: none"> • Explain criteria to check cleaning efficiency of work place • Describe types of contaminations • Explain aseptic technique in microbiology • Demonstrate Swab testing • Explain common microbes growing in air, water and on the surface • Enlist types of disinfectants used for cleaning purpose in microbiology 	4 hours Theory 09 hour Practical Total: 13hours	Cotton swab, Micropipette First aid box, Media bottles, Test Tube and rack, Broth media, Agar media Marker, Lab coat, Mask, Gloves, Head covers	Class Room and workplace/ Lab
LU5. Count colonies	<ul style="list-style-type: none"> • Determine type of microbes • Determine coliform, salmonella and TPC 	<ul style="list-style-type: none"> • Differentiate between gram positive and gram negative bacteria • Demonstrate Indole biochemical test for identification of coliform and salmonella 	6 hours Theory 09 hour Practical Total: 15 hours	Microscope, Glass slides and coverslip, Forceps, Staining solutions, Micropipette	Class Room and workplace/ Lab

				, Dropper, Media and chemical, First aid box, Marker, Lab coat, Mask, Gloves, Head covers	
LU6. Inoculate and incubate microorganism on growth medium	<ul style="list-style-type: none"> • Inoculate/streak the culture media with microorganism • Label the culture media with suitable name/code • Ensure Incubation of culture media at the optimum growth temperature 	<ul style="list-style-type: none"> • Describe optimum environmental condition (Temperature) for the growth of bacteria • Demonstrate labeling of culture media • Differentiate between inoculum and streaking • Demonstrate different inoculation techniques • Explain different types of media and selective media 	12 hours Theory 09 hour Practical Total: 21 hours	Laminar flow hood or Bunsen burner, Incubator, Petri plates, Agar and broth, Test tubes, Test tube racks, Inoculum loop, Marker,	Class Room and workplace/ Lab
LU7. Calculate Total plate count	<ul style="list-style-type: none"> • Operate colony counter • Count colonies • Calculate Total Plate Count (TPC) as Colony Forming Unit (CFU) 	<ul style="list-style-type: none"> • Define Colony Forming Unit (CFU) • Demonstrate working of colony counter 	6 hours Theory 07 hour Practical	Colony counter, Marker, Calculator,	Class Room and workplace/ Lab

		<ul style="list-style-type: none"> • Explain importance of serial dilution in TPC • Explain calculation method of colony forming units (CFU) 	Total: 13 hours	Pen, Log book,	
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Module 03: Comply Quality Standards

Objective: After completing this module, the learner will be proficient to perform in production area according to set quality standards and manual. The trainee will be capable to statistically monitor root causes of variation observed during a batch production through shift and gap analysis. The trainees will be able to design risk assessment management tools CCP and PRP for production of a batch as per standards.

Duration:	Total hours	100	Practical	60	Theory	40
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Perform receiving of raw and packaging material	<ul style="list-style-type: none"> Ensure Physico-Chemical testing of the Raw material as per set Standard Operating procedure Examine COA (Certificate of analysis) Record the results 	<ul style="list-style-type: none"> Describe standard operating procedures for handling and storage of raw and packaging material Demonstrate sampling techniques for raw and packaging material Describe importance of integrity checks/Physico-chemical testing of raw and packaging material Enlist types of commonly used Physico-chemical tests for quality assurance of raw and packaging material Explain importance of COA (Certificate of analysis) 	4 hour Theory 9 hour Practical Total: 13 hours	Packaging material, Certificate of analysis, Technical manual, Chemicals as per required test Marker, Pen, Log book Mask, Gloves, Lab coat, Head covers	Class Room and Workplace/ Lab

LU2. Perform batch making operations	<ul style="list-style-type: none"> • Monitor the weighing of each ingredient as per set recipes • Set the production plant as per developed SOPs. • Operate the equipment to prepare the batch • Execute the production as per set standards • Analyze the production during operations against the Quality Plan 	<ul style="list-style-type: none"> • Describe SOPs for the production of a batch • Describe SOPs (related to hygienic conditions) for the production area • Demonstrate calibration of equipment • Explain quality plan to execute the production of a batch 	08 hour Theory 12 hour Practical Total: 20 hours	Weighing balance, Technical manual, Quality manual, First aid box, Weighing boats, Marker, Lab coat, Mask, Gloves, Helmet, Safety shoes	Class Room and Workplace/ Lab
LU3. Perform sizing, wrapping, and packing operations.	<ul style="list-style-type: none"> • Operate the batch roller and dies for the production of the product as per set weight and size • Operate the cooling section of the line to produce the product as per set standards • Operate the wrapping machines to pack the product • Operate the Packing machines for bag making of the final product as per set standards 	<ul style="list-style-type: none"> • Explain quality parameters for quality monitoring of the batch • Demonstrate batch roller, dies and cooling section • Explain importance of the packing a product • Enlist types of packaging materials 	08 hour Theory 12 hour Practical Total: 20 Hours	Technical manual, Quality manual, SOPs, Batch roller, Dies, wrapping machines, packing machines, Packaging material, First aid	Class Room and workplace/ Lab

				box, Marker, Pen, Log book, Lab coat, Mask, Gloves, Helmet, Safety shoes	
LU4. Monitor quality standards	<ul style="list-style-type: none"> • Ensure the quality parameters and specifications • Monitor the results during the production process • Record the results in the standard document 	<ul style="list-style-type: none"> • Explain quality parameters and specifications as per standards for production • Explain post production review and record • Differentiate between quality control & quality assurance. • Explain importance of Good manufacturing practices (GMP) monitoring and recording log book 	10 hours Theory 12 hour Practical Total: 22 hours	Quality manual, SOPs, Pen, Log book, Lab coat,	Class Room and workplace/ Lab
LU5. Apply basic mathematical calculations	<ul style="list-style-type: none"> • Perform basic mathematics to calculate the shift production • Analyze the results of the different batch by performing basic mathematics and statistical analysis 	<ul style="list-style-type: none"> • Explain calculation of shift production of different batch • Describe importance of shift production in different batch production • Explain Gap analysis and its calculation 	10 hours Theory 15 hour Practical Total: 25 hours	Calculator, Computer, Pen, Log book, Lab coat	Class Room and workplace/ Lab

		<ul style="list-style-type: none"> • Explain importance of CCP and PRP in a production of a batch 			
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Module 04: Implement Quality Management System

Objective: After completing this module, the learner will be capable to implement the quality management system (GMP & GHP). The trainee will be proficient to demonstrate the skills and expertise required to monitor and maintain quality in the work area. The trainee will be able to contribute to the continual improvement of the organization on implementation of audit plan, taking corrective and preventive actions and keeping the traceability records.

Duration:	Total hours	100	Practical	60	Theory	40
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Monitor quality in work area	<ul style="list-style-type: none"> • Ensure good hygiene practices • Ensure good manufacturing practices to confirm the quality of output and/or service • Monitor control points to confirm the quality of output • Identify nonconformities and take corrective actions • Record and report non-conformities 	<ul style="list-style-type: none"> • Explain Good manufacturing practices (GMP) and good hygienic practices (GHP) for working area • Explain HACCP and PRP limits for the quality of output product • Describe purpose of Non-conformities and corrective actions 	6 hour Theory 12 hour Practical Total: 18 hours	Technical manual, Quality manual, Safety standards/ Guidelines, Non-conformities form Corrective action form, Pen, Log book, Lab coat	Class Room and Workplace/ Quality office

LU2. Contribute to continual improvement	<ul style="list-style-type: none"> Investigate barriers to improve quality performance Identify likely causes Implement and report solutions 	<ul style="list-style-type: none"> Differentiate between quality control and quality assurance Describe basic requirements for continual improvement of quality performance Explain the Total Quality Management (TQM) 	6 hour Theory 06 hour Practical Total: 12 hours	SOPs, Technical manual, Quality manual, Safety standards/ Guidelines Pen, Log book, Lab coat	Class Room and Workplace/ Quality office
LU3. Participate in internal audits	<ul style="list-style-type: none"> Identify audit criteria Develop an audit plan Organize audit documents Perform adequacy audit Participate in on-site audit as a team member Perform root cause analysis Develop corrective action preventive action reports Record and maintain information 	<ul style="list-style-type: none"> Define audit and audit types Describe importance of audit plan Explain importance of root cause analysis Explain correlation between corrective and preventive actions Describe reasons of making log book/document of each record 	10 hour Theory 12 hour Practical Total: 22 hours	Technical manual, Quality manual, SOPs, Audit plan form, Root cause analysis form, corrective and preventive action plan form, Pen, Log book, Lab coat	Class Room and workplace/ Quality office
LU4. Implement food quality policy	<ul style="list-style-type: none"> Perform manufacturing Perform products delivery Implement food quality 	<ul style="list-style-type: none"> Describe food quality parameters and specifications as per food 	10 hours Theory 12 hour	Quality manual, Safety	Class Room and workplace/ Quality

	standards <ul style="list-style-type: none"> • Implement food safety standards • Make mutually agreed customer requirements related to food quality and safety 	standards <ul style="list-style-type: none"> • Explain importance of implementing food quality policy • Differentiate between food quality and food safety standards • Explain importance of customer feedback 	Practical Total: 22 hours	standards/ Guidelines, SOPs, Customer food back form, Pen, Log book, Lab coat	office
LU5. Maintain food quality records	<ul style="list-style-type: none"> • Implement traceability • Follow appropriate practices • Perform documentation • Maintain records as legal requirements related documentation • Maintain record relating manufacturing record • Maintain record relating processing • Maintain record relating packing • Maintain record relating packing, distribution, receipt, holding or importation of food products 	<ul style="list-style-type: none"> • Describe importance of traceability • Explain importance of document preparation and records maintenance • Explain appropriate record keeping procedures. • Explain legal requirement related to documentation. 	8 hours Theory 18 hour Practical Total: 26 hours	Quality office, Traceability form, Computer, Printer, Pen, Log book as per required record maintenance, Lab coat	Class Room and workplace/ Quality office

Module 05: Ensure Compliance of Food Safety System

Objective: After completing this module, the learner will be capable to plan and implement HACCP, SOPs, GMP and GHP as per food safety systems/industrial guidelines to control the occurrence of food hazards during production, procurement, manufacturing, storage and distribution of the finished product. The trainee will be proficient to measure risk assessment for future improvement of the system while taking into account traceability records, corrective and preventive action, self-assessment and gap closure.

Duration:	Total hours	100	Practical	70	Theory	30
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Monitor food safety system	<ul style="list-style-type: none"> Conduct risk assessment Ensure compliance of Food Safety system 	<ul style="list-style-type: none"> Explain parameters (risk analysis & risk evaluation) to define risk assessment Describe role of risk assessment in food safety system Describe components of food safety system (Handling, preparation & storage) with safety measures to prevent food borne illness Explain role of good manufacturing practices (GMP) and good hygienic practices (GHP) in food safety system Explain types of food contamination (Physical, chemical & biological) that effect food safety system 	9 hour Theory 6 hour Practical Total: 15hours	Technical manual, Quality manual, Safety standards, SOPs, Food industry guidelines, Risk assessment form, Pen, Log book, Lab coat	Class Room and Quality office

LU2. Perform work according to the Food Safety System	<ul style="list-style-type: none"> • Monitor the production against set standards of the Food Safety system. • Record the results 	<ul style="list-style-type: none"> • Explain components of food safety standards (planning of food safety program and food safety practices) • Describe importance of the use of food safety standards in production of a batch • Importance of documentation and keeping of the records 	6 hour Theory 8 hour Practical Total: 14 hours	Technical manual, Quality manual, Safety standards, SOPs, Food industry guidelines, Computer, Printer, Pen, Log book, Lab coat	Class Room and Workplace/ Quality office
LU3. Apply HACCP principles in food production	<ul style="list-style-type: none"> • Conduct hazard analysis to develop a list of hazards which are of such significance and reasonably likely to cause injury or illness (Principle 1) • Determine critical control points to prevent or eliminate a food safety hazard or reduce it to an acceptable level (CCPs), (Principle 2) • Establish critical limits as per regulatory standards and industry guidelines, (Principle 3) • Establish monitoring 	<ul style="list-style-type: none"> • Define food allergens and its effects • Explain planning of HACCP for implementation of good food safety system • Describe types of hazards (Physical, chemical & microbiological) • Explain effects of microbiological and chemical hazards on the quality of food and health • Explain preventive measures to control happening of a hazards • Differentiate between CCP and PRP 	15 hour Theory 26 hour Practical Total: 41 hours	Technical manual, Quality manual, Safety standards, SOPs, Food industry guidelines, Audit plan, Root cause analysis form, corrective	Class Room and Quality office

	<p>procedures to produce an accurate record for future use in verification (Principle 4)</p> <ul style="list-style-type: none"> Establish corrective actions to identify health hazards and to establish strategies to prevent, eliminate, or reduce their occurrence (Principle 5) Establish verification procedures for identification of the hazards, critical control points, critical limits as per industry guidelines (Principle 6) Establish record-keeping and documentation procedures as per industry guidelines/procedure (Principle 7) 	<ul style="list-style-type: none"> Explain importance of corrective and preventive actions in HACCP system of food industry Describe importance of monitoring and keeping the record of verification procedures as per industry guidelines 		<p>and preventive action plan form, Computer, Printer, Pen, Log book, Lab coat</p>	
LU4. Participate in internal audit procedures	<ul style="list-style-type: none"> Ensure implementation of all relevant SOPs. Maintain record of all checklists and logs Perform self-assessment and gap closure of all applicable standards 	<ul style="list-style-type: none"> Differentiate between internal and external audit Describe advantages/role of internal audit for a food industry Explain importance of operational prerequisite program (O PRP) in food safety system Describe importance of implementing relevant SOPs in food industry 	<p>10 hours Theory</p> <p>20 hour Practical</p> <p>Total: 30 hours</p>	<p>Technical manual, Quality manual, Safety standards, SOPs, Food industry guidelines, Computer, Printer, Pen,</p>	<p>Class Room and Quality office</p>

		<ul style="list-style-type: none"> • Explain importance of self-assessment and gap closure 		Log book, Lab coat	
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Module 06: Monitor Freezing Process

Objective: After completing this module, the learner will be able to apply skills and knowledge to monitor the overall freezing process for different categories of foods and controls required during the freezing process in accordance with the industry's approved guidelines and procedures.

Duration	Total hours	80	Practical	48	Theory	32
Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place	
LU1. Prepare food products for freezing	<ul style="list-style-type: none">Perform all preparatory operations for fruits, vegetable, meat, fish etc.Ensure packing of food products in appropriate packaging materialEnsure sealing the package	<ul style="list-style-type: none">Explain freezing process.Describe different freezing methods.Describe types of packaging material used in freezing process.Describe significance of Blanching in freezing process.Demonstrate vacuum sealing.Describe risks associated with freezing processDefine Freezer Burn and its reason	12 hours Theory 21 hours Practical Total: 33 hours	<ul style="list-style-type: none">FreezerPaperZiploc freezer bagAluminum FoilCling FilmPeelerSteamerBoilerProbe thermometerSealerFreezing chamberLog sheets / Checklists	Workplace	
LU2. Monitor the freezing process	<ul style="list-style-type: none">Calibrate temperature gaugeMonitor temperature of freezerEnsure freezer cleaningExamine the freezing process to meet production requirements	<ul style="list-style-type: none">Define freezing PointExplain cleaning types and techniques used in freezing processDescribe microbiological considerations in freezing processExplain significance and method of monitoring control	14 hours Theory 18 hours Practical Total: 32 hours	<ul style="list-style-type: none">Temperature MonitorHumidity MonitorFreezing ChamberLog Sheets / checklists	Workplace	

		points within the freezing process <ul style="list-style-type: none"> • Describe the effect of freezing process on shelf life of the end product. • Demonstrate calibration 			
LU3. Record information	<ul style="list-style-type: none"> • Record temperature in the appropriate format • Calculate the efficiency of the freezing plant 	<ul style="list-style-type: none"> • Explain units of temperature and how they are interconverted? • Explain document retention time and obsolete documents • Differentiate between Controlled and uncontrolled document • Define Coefficient of Performance (COP) of a refrigerator 	06 hours Theory 09hours Practical Total: 15 hours	<ul style="list-style-type: none"> • Ampere meter • Thermometer • Humidity Monitor • Log sheets / checklists 	Workplace

Module 07: Apply Meat Curing and Smoking

Objective: After completing this module, the learner will be able to apply skills and knowledge to perform meat curing and smoking in accordance with the industry's approved guidelines and procedures.

Duration:	Total hours	100	Practical	60	Theory	40
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Prepare, operate and clean processing equipment used for curing	<ul style="list-style-type: none"> Prepare processing equipment Ensure cleaning of processing equipment according to the manufacturer's specifications, and OH&S, hygiene, and workplace requirements. 	<ul style="list-style-type: none"> Define meat curing and smoking Explain OH&S practices concerning the meat processing industry (PPEs, Labelling of material, machine safety etc.) Demonstrate meat curing process. Demonstrate the procedure for cleaning the processing equipment used for meat curing. 	03 hours Theory 06 hours Practical Total: 09 hours	<ul style="list-style-type: none"> Personal Protective Equipment (face masks, gloves, goggles, hairnet, safety shoes, etc.) Cleaning tools Log sheets / checklists 	Class room and Workplace / Lab
LU2. Prepare meat and ingredients	<ul style="list-style-type: none"> Select meat according to product specifications. Prepare meat by adding ingredients according to product specifications, and hygiene and workplace requirements. 	<ul style="list-style-type: none"> Explain different types of meat products (fermented meat & non-fermented meat products) Describe selection criteria for meat for the curing process Demonstrate process specifications, procedures, and operating parameters of meat curing process Explain function of various additives and ingredients used in meat curing process 	04 hours Theory 9 hours Practical Total: 13 hours	<ul style="list-style-type: none"> Weighing Balance Meat Cutters Log sheets / checklists 	Class room and Workplace / Lab

LU3. Prepare brines	<ul style="list-style-type: none"> • Make brines with the required amount of water and other liquid and solid additives • Operate hydrometer (salinometer) to check the brine solution. 	<ul style="list-style-type: none"> • Define the purpose and importance of brining. • Describe the agents used in brine preparation • Define how to determine the salinity of the brine. • Explain the importance of brine in meat preservation. 	6 hours Theory 6 hours Practical Total: 12 hours	<ul style="list-style-type: none"> • Brine Tanks • Weighing Balance • Thermometer • Hydrometer (Salometer) • Log sheets / checklists 	Class room and Workplace / Lab
LU4. Process and store the product	<ul style="list-style-type: none"> • Perform curing according to product specifications and health regulations. • Monitor process regularly • Make adjustments to the process as required to achieve product specifications. • Store product according to product specifications 	<ul style="list-style-type: none"> • Describe different curing methods • Explain different characteristics of red and white meat • Describe microbial quality related to raw and processed meat. • Explain storage requirements for cured meat • Describe the effect of moisture on casings • Explain the role of curing agents (salts, nitrites, nitrates, shortening, spices and seasonings) 	8 hours Theory 12 hours Practical Total: 20 hours	<ul style="list-style-type: none"> • Automatic injector machine (Injectomat) • Massagers • Pumping equipment • Chiller • Wooden boxes • Log sheets / checklists 	Class room and Workplace / Lab
LU5. Prepare meat and ingredients for smoking	<ul style="list-style-type: none"> • Select meat according to product specifications. • Prepare meat according to product specifications 	<ul style="list-style-type: none"> • Explain purpose and significance of meat smoking • Demonstrate selection criteria for meat for the smoking process • Describe standard hygiene and workplace requirements for meat smoking process • Explain function of various additives and ingredients used in meat smoking process 	7 hours Theory 8 hours Practical Total: 15 hours	<ul style="list-style-type: none"> • Weighing Balance • Meat Cutters • Mincer • Log sheets / checklists 	Class room and Workplace / Lab
LU6. Smoke the meat	<ul style="list-style-type: none"> • Check the product to ensure 	<ul style="list-style-type: none"> • Explain standard process 	06 hours	<ul style="list-style-type: none"> • Smoking 	Class room

products	<p>correct spacing prior to loading.</p> <ul style="list-style-type: none"> Record the core temperature of the meat product. Operate meat smoker. 	<p>requirements for meat smoking.</p> <ul style="list-style-type: none"> Demonstrate to measure the core temperature of meat products Demonstrate meat smoking Describe the advantages & disadvantages of smoking Explain the effect of meat aging on smoking process. 	<p>Theory 14 hours Practical Total: 20 hours</p>	<p>chamber</p> <ul style="list-style-type: none"> Smoke generator Smoke jet Probe Thermometer Aluminum Foil Bowl/Pan Log sheets / checklists 	and Workplace / Lab
LU7. Chill the meat products	<ul style="list-style-type: none"> Ensure the chilling of smoked meat. Store meat products according to SOPs. Ensure stacking of product according to product specifications and workplace requirements. 	<ul style="list-style-type: none"> Describe the storage requirements of smoked meat Describe the effect of chilling process after smoking Explain the purpose and requirements for stacking smoked meat Explain the attribution of smoking process on flavor enhancement and preservation. 	<p>06 hours Theory 08 hours Practical Total: 14 hours</p>	<ul style="list-style-type: none"> Chiller Probe Thermometer Log sheets / checklists Freezer 	Class room and Workplace / Lab

Module 08: Prepare Different Types of Cheese

Objective: After completing this module, the learner will be able to apply skills and knowledge to prepare different types of cheese in accordance with the industry's approved guidelines and procedures.

Duration:	Total hours	100	Practical	60	Theory	40
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Check/analyze quality of raw milk	<ul style="list-style-type: none"> • Ensure quality control tests of milk • Perform determination of Fat percentage • Perform determination of Solids Not Fat (SNF) • Ensure temperature of storage tank/chiller 	<ul style="list-style-type: none"> • Describe the standard quality parameters of milk • Demonstrate methods for detection of adulterants milk (formalin, urea, detergent, starch, glucose, sorbitol, sugar, etc.) • Demonstrate compositional analyses of milk (fat, protein, SNF, LR, moisture, Ash, total solids etc.) • Describe standard storage conditions for milk 	3 hours Theory 09 hours Practical Total: 12 hours	<ul style="list-style-type: none"> • Milk analysis lab • Gerber Machine • Lactometer • Moisture analyzer • Oven • Weighing Balance • Burner • Butyrometer • Thermometer • water bath • Glassware • Milk pipettes • Log sheets / checklists 	Workplace / Lab
LU2. Pasteurization of milk	<ul style="list-style-type: none"> • Check pasteurizer to confirm readiness for use • Ensure standard time and temperature for pasteurization 	<ul style="list-style-type: none"> • Explain standard process and hygiene requirements for milk pasteurization • Demonstrate the 	3 hours Theory 9 hours Practical	<ul style="list-style-type: none"> • Pasteurizer • Chiller • thermometer • Log sheets / checklists 	Workplace / Lab

	<ul style="list-style-type: none"> Operate pasteurizer to meet production as per standard requirements 	<p>procedure to operate milk pasteurizer</p> <ul style="list-style-type: none"> Describe the control points in milk pasteurization process 	Total: 12 hours		
LU3. Inoculate culture	<ul style="list-style-type: none"> Select proper type of culture Check quantity/dosage of culture Ensure optimum storage temperature 	<ul style="list-style-type: none"> Explain starter culture used in cheese making Describe the functions performed by starter culture in cheese making process Enlist physical and chemical changes occur during starter culture inoculation in milk Demonstrate the standard process requirements to inoculate culture in cheese making process 	<p>3 hours Theory</p> <p>6 hours Practical</p> <p>Total: 9 hours</p>	<ul style="list-style-type: none"> Weighing Balance pH meter thermometer Log sheets / checklists Mother culture 	Workplace / Lab
LU4. Perform addition of rennet	<ul style="list-style-type: none"> Apply rennet for curdling of milk Monitor pH change in coagulum Ensure proper dosage of calcium chloride (CaCl₂) 	<ul style="list-style-type: none"> Describe function of enzymes used in milk curdling process Demonstrate curd preparation from milk Enlist methods used to coagulate milk for cheese making Demonstrate standard process requirements for rennet addition in cheese making 	<p>3 hours Theory</p> <p>6 hours Practical</p> <p>Total: 9 hours</p>	<ul style="list-style-type: none"> Weighing Balance thermometer pH meter Log sheets / checklists 	Workplace / Lab
LU5. Monitor curd production and cutting process	<ul style="list-style-type: none"> Ensure curdling of milk Perform cheese cutting process according to standard 	<ul style="list-style-type: none"> Enlist factors affecting curd firmness Describe physical and chemical changes during curd production 	<p>5 hours Theory</p> <p>6 hours Practical</p>	<ul style="list-style-type: none"> Pilot cheese making plant thermometer Log sheets / checklists 	Workplace / Lab

		and cutting <ul style="list-style-type: none"> Describe the effect of curd production and cutting process on the end product Describe quality characteristics to be achieved in curd making Demonstrate process specifications, procedures, and operating parameters of curd production and cutting process 	Total: 11 hours		
LU6. Operate pressing and molding machine	<ul style="list-style-type: none"> Determine acidity and pH to assess proper time to press Operate pressing vats for whey separation Ensure that pressing and molding process is set to meet production requirements 	<ul style="list-style-type: none"> Explain the purpose and basic principles of the pressing and moulding process Describe stages and changes which occur during pressing and molding Enlist types of additives and ingredients during pressing and molding Describe quality characteristics to be achieved in pressing and molding 	5 hours Theory 6 hours Practical Total: 11 hours	<ul style="list-style-type: none"> Pressing and moulding machine pH meter thermometer Log sheets / checklists 	Workplace / Lab
LU7. Monitor pressing and moulding process	<ul style="list-style-type: none"> Check equipment to confirm operating condition Ensure the pressing and moulding process is started up according to company specifications 	<ul style="list-style-type: none"> Describe effect of pressing and molding process on the end product Describe significance and methods of monitoring control points 	4 hours Theory 6 hours Practical Total: 10 hours	<ul style="list-style-type: none"> Pressing and moulding machine thermometer pH meter Log sheets / checklists 	Workplace / Lab

	<ul style="list-style-type: none"> • Operate moulding machines • Ensure pressed and the moulded product meets specifications 	<ul style="list-style-type: none"> • within the pressing and moulding process • Demonstrate process specifications, procedures, and operating parameters of pressing and moulding process 			
LU8. Apply salting of cheese	<ul style="list-style-type: none"> • Ensure salt dose according to formulation specifications • Perform salting/brining of cheese • Ensure pH and moisture 	<ul style="list-style-type: none"> • Explain the purpose of salt addition in cheese • Describe significance of salt addition in cheese • Demonstrate to measure the moisture and pH of cheese 	5 hours Theory 6 hours Practical Total: 11 hours	<ul style="list-style-type: none"> • Moisture analyzer • Oven • Weighing Balance • pH meter • Log sheets / checklists 	
LU9. Ensure ripening of cheese	<ul style="list-style-type: none"> • Ensure temperature during aging • Check flavor development during aging • Check taste development • Check eyes development 	<ul style="list-style-type: none"> • Describe quality characteristics to be achieved in pressing and molding • Demonstrate methods of sensory evaluation 	5 hours Theory 3 hours Practical Total: 8 hours	<ul style="list-style-type: none"> • pH meter • thermometer • Log sheets / checklists 	
LU10. Pack and store cheese	<ul style="list-style-type: none"> • Select appropriate packaging material • Operate packaging machine • Ensure optimum storage temperature 	<ul style="list-style-type: none"> • Explain characteristics of packaging material used in cheese packaging • Explain standard storage requirements for cheese 	4 hours Theory 3 hours Practical Total: 7 hours	<ul style="list-style-type: none"> • Packaging machine • thermometer • Log sheets / checklists 	

Module 09: Prepare Sugar

Objective: After completing this module, the learner will be able to apply skills and knowledge to prepare sugar in accordance with the industry's approved guidelines and procedures.

Duration:	Total hours	80	Practical	48	Theory	32
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Check juice extraction process	<ul style="list-style-type: none"> Operate crusher Operate presser Ensure bagasse separation from juice Operate juice extractor Ensure sugar separation from stalks Check brix of juice 	<ul style="list-style-type: none"> Explain sensory evaluation and its types Demonstrate washing, cutting and shredding cane Explain the types of roller mills used in preparation of sugar Explain the uses of bagasse Describe quality characteristics of cane juice to prepare sugar 	7 hours Theory 9 hours Practical Total: 16 hours	<ul style="list-style-type: none"> Weighing balance Refractometer thermometer Log sheets / checklists 	workplace
LU2. Monitor clarification and evaporation	<ul style="list-style-type: none"> Check lime Ensure Heat lime Ensure sedimentation of muds Perform filtration Ensure moisture percentage of juice Operate evaporator Analyze brix and moisture of syrup 	<ul style="list-style-type: none"> Describe quality characteristics of cane juice Describe the purpose of clarification in sugar preparation Demonstrate different techniques used for clarification in sugar preparation Explain the significance of liming in sugar preparation 	9 hours Theory 15 hours Practical Total: 24 hours	<ul style="list-style-type: none"> Evaporator Moisture analyzer Refractometer Filtration assembly Weighing balance thermometer Log sheets / checklists 	workplace

		<ul style="list-style-type: none"> Describe the purpose of evaporation process in context of sugar preparation. Explain classification of syrups Describe quality characteristics of syrup after clarification and evaporation. 			
LU3. Perform crystallization	<ul style="list-style-type: none"> Operate crystallization machine Check grain size Check seed size Check massecuite in crystallizers Operate centrifugal machine 	<ul style="list-style-type: none"> Explain process and specifications of crystallization Explain operating parameters of crystallization in sugar preparation Describe the stages of crystallization in sugar preparation Demonstrate centrifugation in sugar preparation Explain molasses and its uses Explain the effect of temperature and other parameters on crystallization. 	10 hours Theory 15 hours Practical Total: 25 hours	<ul style="list-style-type: none"> Centrifuge Crystallizer Boiling Pan Weighing balance thermometer Log sheets / checklists 	workplace
LU4. Dry and pack sugar	P1: Operate sugar dryer P2: Operate screens vibrator to sort sugar crystals according to size P3: Select appropriate packaging and	<ul style="list-style-type: none"> Explain process and specifications relating to drying of sugar. Demonstrate the working of screen vibrator in sugar 	6 hours Theory 9 hours Practical Total: 15	<ul style="list-style-type: none"> Screen Vibrator Cylinder dryer Filling machine 	workplace

	labeling material P4: Ensure storage at ambient conditions	preparation <ul style="list-style-type: none">• Enlist the types of packaging material used to pack sugar• Describe standard storage conditions for sugar	hours	<ul style="list-style-type: none">• Packaging machine• Log sheets / checklists	
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Module 10: Prepare Extruded Products

Objective: After completing this module, the learner will be able to apply skills and knowledge to prepare extruded products in accordance with the industry's approved guidelines and procedures.

Duration:	Total hours	80	Practical	48	Theory	32
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Prepare extrusion ingredients	<ul style="list-style-type: none"> Select ingredients for batch preparation as per standards Ensure grinding of ingredients to achieve consistency as per set quality standards for further processing Check particle size of ground material 	<ul style="list-style-type: none"> Describe extrusion technology Describe types of extruders (piston extruder, roller type extruder, single and twin screw extruder) used in food extrusion technology Explain advantages and disadvantages of extruded products Describe few example of extruded products (pasta, breakfast cereals, bread crumbs, biscuits, crackers, croutons, baby foods, snack foods etc.) Explain main ingredient (starch & protein) of extruded products Describe the effect of starch on the shape and 	6 hour Theory 6 hour Practical Total: 12 hours	Grinder, Sieves for measuring particle size, Ingredients for extruded product batch	Class Room and workplace

		<p>texture of extruded products</p> <ul style="list-style-type: none"> Describe effect of particle size of extruded product on physical properties and digestibility of the products 			
LU2. Mix extrusion ingredients	<ul style="list-style-type: none"> Operate pre conditioner for mixing of ingredients Ensure time and temperature during mixing Ensure addition of all ingredients and additives to form dough/mix (Extrudate) Check quality of extrudate as per organizational procedures 	<ul style="list-style-type: none"> Demonstrate fundamental steps of extrusion (mixing, cooking, shearing, puffing, final shaping and drying) Describe importance of time and temperature during mixing of ingredients Explain food additives (emulsifiers, thickeners, flavor & color) and their role in extrusion. Describe parameters (water absorption, water solubility, oil absorption indexes, expansion index and viscosity of the dough) of extruded product for quality assurance of the product 	<p>6 hour Theory</p> <p>6 hour Practical</p> <p>Total: 12 hours</p>	<p>Mixing chamber, Timer, Thermometer, Food additives, Media and chemicals as per required quality test</p>	Class Room and workplace
LU3. Perform extrusion	<ul style="list-style-type: none"> Check extruder and its utilities before operation Ensure cleaning of all accessories Operate extruder Check quality of extruded product 	<ul style="list-style-type: none"> Explain Good manufacturing practices (GMP) and good hygienic practices (GHP) for working area and equipment (extruder) 	<p>6 hour Theory</p> <p>12 hour Practical</p> <p>Total: 18 hours</p>	<p>Food extruder quipped with accessories, Non-conformance form, Log book, Check</p>	Class Room and workplace

	<p>as per specs</p> <ul style="list-style-type: none"> Report to in charge in case of non-conformance 	<ul style="list-style-type: none"> Describe importance of equipment maintenance and calibration on regular basis Demonstrate the working of extruder Explain different properties (physical, chemical and sensory evaluation) of extruded product for quality assurance of final product Explain non-conformance and its importance 		list	
LU4. Perform Frying	<ul style="list-style-type: none"> Check fryer and its utilities before operation Ensure cleaning of all accessories Operate fryer Check quality of fried extruded product as per specs Report to incharge in case of non-conformance 	<ul style="list-style-type: none"> Explain Good hygienic practices (GHP) for equipment (fryer) Describe importance of equipment maintenance and calibration on regular basis Explain different properties (physical, chemical and sensory) of fired extruded product for quality assurance Explain non-conformance and its prevention Demonstrate the working of fryer 	<p>6 hour Theory</p> <p>12 hour Practical</p> <p>Total: 18 hours</p>	Fryer, Non-conformance form, Log book, Check list	Class Room and workplace

LU5. Perform Drying	<ul style="list-style-type: none"> • Operate dryer • Ensure moisture contents in finished product as per specifications. 	<ul style="list-style-type: none"> • Describe factors affecting shape of the extruded products (formulation of premix, moisture, temperature, extruder pressure, die shape and cutter) • Describe the effect of moisture content on texture of extruded product • Demonstrate the working of dryer 	6 hour Theory 6 hour Practical Total: 12 hours	Dryer, Non-conformance form, Log book, Check list	Class Room and workplace
LU6. Pack and store Extruded products	<ul style="list-style-type: none"> • Ensure the selection of appropriate packaging material • Operate packaging machine • Ensure optimum storage temperature 	<ul style="list-style-type: none"> • Explain the characteristics of a good food packaging material • Enlist types of packaging material used in food • Explain environmental factors (temp & humidity) that effect food quality, food storage and packaging 	4 hour Theory 6 hour Practical Total: 10 hours	Packaging material, Packaging machine Sealer Shrink wrap	Class Room and workplace

Module 11: Produce Confections

Objective: After completing this module, the learner will be able to apply skills and knowledge to produce confections in accordance with the industry's approved guidelines and procedures.

Duration:	Total hours	80	Practical	48	Theory	32
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Receive and store raw materials as per manufacturing order	<ul style="list-style-type: none"> Inspect raw material as per quality standards Store raw materials at appropriate condition 	<ul style="list-style-type: none"> Explain sensory evaluation and its types Explain the hazards associated with raw materials. Explain the impact of raw material quality on the end product. Describe the types of storages to store raw materials (i.e. Dry, refrigeration, chilling) Describe cross contamination and hazards associated with it. 	3 hours Theory 6 hours Practical Total: 9 hours	<ul style="list-style-type: none"> Log sheets / checklists Refrigerator Freezer 	Laboratory and workplace
LU2. Mix ingredients as per standard recipe	<ul style="list-style-type: none"> Perform melting of sugar and butter together Ensure consistency of mix by stirring Check brix and viscosity 	<ul style="list-style-type: none"> Define melting and boiling point. Define brix and viscosity. Describe the physical and chemical changes occur during melting Describe the risks associated in melting sugar and butter 	4 hours Theory 6 hours Practical Total: 10 hours	<ul style="list-style-type: none"> Refractometer Viscometer Thermometer Cooking pan Log sheets / checklists 	Workplace

		together			
LU3. Perform cooking of batch	<ul style="list-style-type: none"> • Ensure preparation of syrups of required brix • Ensure addition of all additives • Ensure optimum temperature • Check bubbles of mix 	<ul style="list-style-type: none"> • Define syrups. • Describe the risks associated with cooking process • Explain the standard process requirements for cooking process • Explain role of different additives used for syrup preparation 	5 hours Theory 6 hours Practical Total: 11 hours	<ul style="list-style-type: none"> • Refractometer • thermometer • Cooking pan • Log sheets / checklists 	Workplace
LU4. Perform rolling and moulding	<ul style="list-style-type: none"> • Operate rolling machine to produce sheet of uniform size • Operate moulder/shaping machine 	<ul style="list-style-type: none"> • Enlist the types of rolling and moulding machines • Demonstrate the operation of rolling machine • Demonstrate the procedure to operate moulding machine • Describe the safety and quality risks associated with rolling and moulding operation 	5 hours Theory 9 hours Practical Total: 14 hours	<ul style="list-style-type: none"> • Rolling machine • Moulder • Log sheets / checklists 	Workplace
LU5. Prepare chocolate confection	<ul style="list-style-type: none"> • Ensure mixing of ingredients • Perform tempering of mixture • Operate moulder/sheeter 	<ul style="list-style-type: none"> • Explain process and specifications of chocolate confection preparation. • Explain operating parameters to prepare chocolate confection • Enlist ingredients used in preparing chocolate confection • Describe critical points in preparing chocolate confection 	6 hours Theory 9 hours Practical Total: 15 hours	<ul style="list-style-type: none"> • Weighing balance • Refiner • refrigerator • Log sheets / checklists 	Workplace

		<ul style="list-style-type: none"> Describe the quality characteristics of a chocolate confection Demonstrate the working of moulder/sheeter 			
LU6. Prepare gums	<ul style="list-style-type: none"> Ensure mixing of ingredients Operate moulder/shaping machine Check gum elasticity 	<ul style="list-style-type: none"> Explain process and specifications to prepare gums. Explain operating parameters to prepare gums Enlist ingredients of a gum base Explain critical points in preparing gums Describe the quality parameters of a gum base 	6 hours Theory 6 hours Practical Total: 12 hours	<ul style="list-style-type: none"> Rolling machine Moulder Weighing balance Log sheets / checklists 	Workplace
LU7. Perform wrapping and packaging	<ul style="list-style-type: none"> Ensure selection of appropriate packaging material Operate wrapping machine Ensure bulk packaging 	<ul style="list-style-type: none"> Enlist the types of packaging material used for confections Demonstrate the operation of wrapping machine Explain the risks associated in bulk packaging of confections 	3 hours Theory 6 hours Practical Total: 9 hours	<ul style="list-style-type: none"> Wrapping machine Packaging Machine Log sheets / checklists 	Workplace

Module 12: Ensure Quality Control in Food Industry

Objective: After completing this module, the learner will be able to apply skills and knowledge to ensure quality control in food industry in accordance with the industry's approved guidelines and procedures.

Duration:	Total hours	90	Practical	54	Theory	36
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Check the quality of raw material	<ul style="list-style-type: none"> Ensure the quality of raw material as per specification Perform physical, chemical and microbiological analysis Keep record of raw materials 	<ul style="list-style-type: none"> Describe sensory evaluation Demonstrate physical, chemical and microbial analysis of raw material. Explain the impact of raw material quality on the end product 	6 hours Theory 12 hours Practical Total: 18 hours	<ul style="list-style-type: none"> Log sheets / checklists Microscope Autoclave Titration apparatus 	laboratory and workplace
LU2. Check Lab testing equipment	<ul style="list-style-type: none"> Ensure all lab equipment in a well-maintained condition Ensure in time calibration of all equipment 	<ul style="list-style-type: none"> Define calibration Explain the disadvantages of using uncalibrated equipment Describe the importance of equipment maintenance and calibration program 	6 hours Theory 6 hours Practical Total: 12 hours	<ul style="list-style-type: none"> Log sheets / checklists Calibrations gauges, standards, devices etc. 	Laboratory and workplace
LU3. Prepare product according to specifications	<ul style="list-style-type: none"> Ensure standard procedures to make food products Perform analysis at each step of product preparation 	<ul style="list-style-type: none"> Define standardization Explain SOPs and its importance in industrial practices Describe the importance of control points in production line 	8 hours Theory 15 hours Practical Total: 23 hours	<ul style="list-style-type: none"> Log sheets / checklists 	laboratory and workplace
LU4. Perform Sensory evaluation of the	<ul style="list-style-type: none"> Conduct sensory evaluation as per 	<ul style="list-style-type: none"> Explain interpretation of 	5 hours Theory	<ul style="list-style-type: none"> Log sheets / 	laboratory and

product	<p>standard</p> <ul style="list-style-type: none"> Analyze and interpret sensory evaluation results 	<p>results regarding hedonic scale</p> <ul style="list-style-type: none"> Explain differential and ranking test in sensory evaluation. 	<p>6 hours Practical</p> <p>Total: 11 hours</p>	<p>checklists</p> <ul style="list-style-type: none"> Glassware (Spoons, spatulas, beakers, petri dishes, flasks etc) 	workplace
LU5. Carry out Preventive measures	<ul style="list-style-type: none"> Ensure preventive maintenance schedule is followed Keep record of each maintenance 	<ul style="list-style-type: none"> Describe the importance in carrying out preventive measure Differentiate between a preventive and corrective action Explain preventive maintenance schedule 	<p>5 hours Theory</p> <p>6 hours Practical</p> <p>Total: 11 hours</p>	<ul style="list-style-type: none"> Log sheets / checklists 	laboratory and workplace
LU6. Check the quality of the final product	<ul style="list-style-type: none"> Perform random sampling from the final product Check the frequency of sampling as per SOP Maintain final product analysis record Ensure the traceability of each batch 	<ul style="list-style-type: none"> Define product recall and its tools Demonstrate different sampling techniques Explain the impact of sampling on analysis of the product Describe the importance of tractability of a product. 	<p>6 hours Theory</p> <p>9 hours Practical</p> <p>Total: 15 hours</p>	<ul style="list-style-type: none"> Log sheets / checklists Sampling tools 	laboratory and workplace

SUPPORTIVE NOTES:

Assessment context, Critical aspects, Assessment conditions

Formative assessment: The specification of the expected performance demonstrated by the trainee at the conclusion of the learning experiences in a particular module or course. It is used to assess the necessary knowledge, skills and attitudes, reflecting the performance standard in the relevant industry or competency standards. Formative assessment may include observation, simulation, questioning, presentation/ demonstration and written assessment at the end of each module. The various methods or techniques used to gather evidence of sufficiency and quality in which to make a sound judgment on the competency of a learner.

Summative assessment (Level wise): Assessors need to plan in advance how they will conduct summative assessments covering all modules. There must be a maximum of 6-8 trainees per assessor and if there are two assessors than 12 students can be assessed within a day and 24 students in 2 days. The entire course can be tested in the summative assessment covering all 12 modules (Level-5 = 12). Direct observation is an important approach in assessing the attitude of the students toward work, observance of safety rules and regulations, and how they interact and relate with other trainees and instructor. Training providers need to decide ways to combine modules into a cohesive two-day final assessment programme for each group of 6-8 trainees. Assessment methods may include observation, simulation, questioning, presentation/ demonstration and written assessment. The various methods or techniques used to gather evidence of sufficiency and quality in which to make a sound judgment on the competency student or learner. Training providers must agree the settings for practical assessments in advance.

List of Tool And Equipment		
Sr. No.	Tools	Required items for 24 candidates
1.	Food processing system with, boiler, cooker, steamer, dehydrator, concentrator, separator, heat exchanger and all types, mixers, valves all type, conductivity meters, level switches, sensors type, nozzles, gauges, weighing scales	1 Unit each
2.	Chiller, compressors, RO (reverse osmoses), Filters.	1 Unit each
3.	Refrigerator, cooling agents,	1 Unit each
4.	Freezer, incubators	1 Unit each
5.	Stoves	6 No.
6.	Food packaging system with filling and sealing, can seamer, shrink wrapper, stripper, case packer, labeler, cap applicators, case sealer, lifters, card board packer, milters	1 Unit each
7.		1 Unit each
8.	Trolley, liquid jacked tanks	1 Unit each
9.	Poly/temperature sealer, shrink machines, cylinders	1 Unit each
10.	Cap sealer	1 No.
11.	Pressure cooker	2 No.
12.	Cap seal	1 No.
13.	Steam-jacketed kettle	1 No.
14.	Smoking trays	6 No.
15.	Meat grinder	1 No.
16.	Stuffer/linker	1 No.
17.	Brix Refractometer (0-90° brix)	2 No.
18.	Electronic scales (0.1 gm. capacity)	1 No.
19.	Consist meter/viscometer	1 No.
20.	Vacuum pack machine	1 No.

21.	Laboratory scale cabinet drier or forced draft oven	1 No.
22.	Headspace gauge	2 No.
23.	Test equipment – pH meter, centrifuge, moisture meter, color chart/colorimeter, texture meter	2 Unit each
24.	First aid kit	1 No.
25.	PPE – apron, face mask, gloves (chemical gloves, surgical, electrical & Steam gloves), gum shoes (rubber shoes) chemical suit, face shelled, safety helmet, air protectives, goggles	24 No.
26.	Computer system	1 No.
Tools / Supplies		
1.	Measuring spoons	6 Set
2.	Measuring cups (solid)	6 Set
3.	Measuring cups (liquid)	6 Set
4.	Wrench, screw driver, belts, nuts and bolts, spanners (open, ring combinations) pallairs, L kays, star keys, stretched p allairs, gas pipe	
5.	Clocks/timer	6 No.
6.	Mixing bowls, stainless steel	6 No.
7.	Hard plastic chopping boards (white, blue, green)	6 unit each
8.	Thermometers of varying temperature range	10 No.
9.	Jar liter	24 No.
10.	Food processor set	2 No.
11.	Wire baskets	3 No.
12.	Casseroles stainless steel	3 No.
13.	Saucepan, stainless steel	6 No.
14.	Spoons, wooden	6 No.

15.	Spoon, basting	6 No.
16.	Paddles, wooden	6 No.
17.	Food tongs	6 No.
18.	Steamer	1 No.
19.	Soaking container	6 No.
20.	Fermented containers	2 No.
21.	Utility trays	6 No.
22.	Colanders, stainless steel	2 No.
Packaging machinery		
6.	Capping machine	1 No.
7.	Crown corking machine	1 No.
8.	Form fill seal machine (a) 3 side sealing (b) Pillow type	1 No.
9.	Cup filling & sealing machine	1 No.
10.	Horizontal packing machine	1 No.
11.	Twist wrap machine	1 No.
12.	Fold wrap machine	1 No.

Sr. No.	Consumable Items	Quantity for 24 candidates
1.	NaOH (PELLETS)	3 Kg
2.	HNO ₃	3 ltr
3.	H ₂ SO ₄	2.5 ltr
4.	Ethanol (Absolute)	5 Ltr
5.	Phenolphthalein	1 Bottle (100 gm)
6.	Burette Set	6 No.

7.	Pipette 1ml	10 No.
8.	Pipette 5ml	10 No.
9.	Pipette 10 ml	10 No.
10.	Pipette 10.94 ml	5 No.
11.	Auto sucker	10 No.
12.	Volumetric flask 100 ml	5 No.
13.	Volumetric flask 250 ml	5 No.
14.	Volumetric flask 500 ml	5 No.
15.	Volumetric flask 1000 ml	5 No.
16.	Measuring Cylinder 100 ml	5 No.
17.	Measuring Cylinder 500 ml	5 No.
18.	Measuring Cylinder 1000 ml	5 No.
19.	Reagent Bottles	10 No.
20.	Glass Beaker 50 ml	5 No.
21.	Glass Beaker 100 ml	5 No.
22.	Glass Beaker 250 ml	5 No.
23.	Glass Beaker 500 ml	5 No.
24.	Pycnometer	5 No.
25.	Capillary tube	1 Box
26.	Filter paper (90 mm)	2 Box
27.	Butyrometer 8 %	5 No.
28.	Butyrometer 40 %	5 No.
29.	Butyrometer 80 %	5 No.
30.	Lactometer	10 No.
31.	Rubber stoppers	20 No.
32.	China Dish	10 No.
33.	Iso amyl alcohol	1 ltr
34.	Test tube 20 ml	20 No.
35.	Thermometer (0-100 C)	10 No.
36.	Plate Count Agar	1 box
37.	Violet Red Bile Agar	1 box
38.	Potato Dextrose Agar	1 Box
39.	Swab Sticks	1 Box
40.	S-S Agar	1 Box
41.	Inoculating loops	5 No.
42.	Spirit lamp	5 No.
43.	Hexane	2.5 ltr

44.	CMC	1 kg
45.	Citric Acid	1 kg
46.	Pectin Powder	1 kg
47.	Sodium benzoate	100 gm
48.	KMS	100 gm
49.	Sodium Citrate	100 gm
50.	Baking Powder	1 kg
51.	Yeast (Sachet)	50 No.
52.	Baking Soda	1 kg
COLORS		
53.	Caramel Liquid	100 ml
54.	Apple Green	100 gm
55.	Sunset Yellow	100 gm
56.	Apple Red	100 gm
57.	Cloudifying Agent	250 ml
58.	Lime YELLOW	100 gm
FLAVORS		
59.	Apple	250 ml
60.	Strawberry	250 ml
61.	Mango Chaunsa	250 ml
62.	Chocolate	250 ml
63.	Vanilla	250 ml
64.	Orange	250 ml
65.	Pineapple	250 ml
SPICES		
66.	Salt	1 kg
67.	Red Chili (Powder)	1 kg
68.	Black pepper (Powder)	500 gm
69.	Mix masala	500 gm
70.	Chicken Tikka Masala	5 Box
71.	Chicken Tandoori Masala	5 Box
72.	Chaat Masala	5 Box
73.	Chicken Cubes	2 Box
Grocery/fruits/vegetables		
74.	Chicken, Beef, Mutton, Fish	10 kg each
75.	Fine Flour	20 kg
76.	Sugar	50 kg
77.	Cooking Oil	10 ltr

78.	Ghee	5 kg
79.	Lemon	5 kg
80.	Tomatoes	10 kg
81.	Potatoes	10 kg
82.	Green Chili	2 kg
83.	Capsicum	2 kg
84.	Cheddar Cheese	10 kg
85.	Mozzarella Cheese	10 kg
86.	Skimmed Milk Powder	1 Kg
87.	Condensed Milk	5 Jar
88.	Fresh Milk	20 ltr
89.	Empty Metal Can (500 gm)	25 No.
90.	Empty Plastic Bottles (750 ml)	50 No
91.	Empty Glass Jars (500 gm)	25 No.
92.	Plastic Wrapping Sheet	1 Roll
93.	Aluminum Foil	2 Roll