



Kingdom of Cambodia
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National Training Board
Ministry of Labour and Vocational Training

Competency-Based Curriculum Food Processing and Analysis, Level 5



Department of Standard and Curriculum

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	L.O1 Meet common and specific communication needs of clients and colleagues	
	L.O2 Contribute to the development of communication strategies	
	L.O3 Represent the organization	
	L.O4 Facilitate group discussion	
	L.O5 Conduct interviews	
	MANMT0502 SUPERVISE DEVELOPMENT OF TEAMS & INDIVIDUALS	
	L.O1 Supervise team leadership development	
	L.O2 Foster individual and organizational growth	
	L.O3 Monitor and evaluate workplace learning	
	L.O4 Develop team commitment and cooperation	
	L.O5 Facilitate accomplishment of organizational goals	
	MANMT0503 SUPERVISE PROBLEM SOLVING TECHNIQUES IN THE WORKPLACE	
	L.O1 Analyze the problem	
	L.O2 Identify the possible solution	
	L.O3 Recommend solution to teams or higher management	
	L.O4 Implement & Supervise Solution	
	L.O5 Monitor outcomes	
	MANMT0504 SUPERVISE DATA COLLECTION AND ANALYSIS IN THE WORKPLACE	

	L.O1	Study information requirements	
	L.O2	Process Data collected	
	L.O3	Analyse, interpret and organize information gathered	
	L.O4	Present findings, recommendations	
	MANMT0505 PLAN & ORGANIZE WORK FOR SEVERAL WORK TEAMS		
	L.O1	Set objectives	
	L.O2	Plan and schedule work activities	
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	MANMT0507 SUPERVISE OHS WORK ISSUES IN THE CONSTRUCTION INDUSTRY		
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	L.O2	Interpret compliance of SOP, manuals & specifications	
	L.O3	Recording & reporting	
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	L.O1	Supervise planning of resource requirements	
	L.O2	Supervise requisition & acceptance of resources	
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	L.O1	Analyze signs, symbols, and data	
	L.O2	Interpret technical drawings and work plans	

	L.O3 Approve drawings & plans	
CORE COMPETENCIES		
MANFA8501 PERFORM BASIC MEASUREMENTS AND CALIBRATION TECHNIQUES IN THE LABORATORY		
	L.O1 Identify chemical compounds	
	L.O2 Prepare chemical solutions of known concentrations	
	L.O3 Perform calibration of testing / measuring instruments	
	L.O4 Perform basic laboratory measurements/techniques (length, weight, volume, pH, temperature)	
	L.O5 Perform data and unit conversion	
MANFA8502 CONDUCT PHYSICAL AND CHEMICAL CHECKS/TESTS ON RAW / PROCESSED AGRICULTURAL PRODUCTS		
	L.O1 Determine moisture content and water activity of food	
	L.O2 Identify suitable raw materials/ingredients for application in food products	
	L.O3 Conduct qualitative and quantitative checks on raw materials, processed/finished products, food ingredients, and packaging materials	
	L.O4 Evaluate sensory properties/ characteristics of food products/ingredients	
	L.O5 Comply with food labeling requirements	
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	L.O1 Perform basic microbiological techniques	
	L.O2 Conduct microscopic examination of specimens	
	L.O3 Conduct environmental monitoring	
	L.O4 Prepare solid and liquid media	
	L.O5 Prepare food samples for analysis	
	L.O6 Conduct microbial analysis of food samples	
	L.O7 Perform decontamination and disposal of biological waste and labware	
MANFA8504 MAINTAIN FOOD SAFETY AND FOOD HYGIENE STANDARDS IN THE AGRI-FOOD SUPPLY CHAIN		
	L.O1 Conduct a hazard analysis to identify potential food safety hazards	
	L.O2 Monitor food safety and quality parameters in food safety quality management systems	
	L.O3 Carry out food hygiene inspection at food premises	
	L.O4 Carry out corrective/preventive actions	
	L.O5 Carry out logging and documentation	

	MANFA8505 CONDUCT CHEMICAL ANALYSIS FOR RAW / PROCESSED AGRICULTURAL PRODUCTS	
	L.O1 Prepare food samples for analysis	
	L.O2 Conduct titrimetric analysis	
	L.O3 Perform advanced instrumental analysis (chromatographic/spectroscopic techniques, rapid methods)	
	L.O4 Carry out proximate analysis	
	L.O5 Carry out maintenance of food analytical instruments	
	L.O6 Perform laboratory data organization, presentation, and analysis	
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	L.O1 Conduct unit operation safety assessment and check	
	L.O2 Conduct pre-treatment of raw materials	
	L.O3 Perform mixing of food ingredients	
	L.O4 Carry out thermal treatment of food products	
	L.O5 Perform drying techniques	
	L.O6 Perform packaging of food products (including smart packaging)	
	L.O7 Perform low-temperature treatment of food products	
	L.O8 Perform equipment cleaning and product changeover	
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	L.O1 Apply chemical preservation methods	
	L.O2 Carry out physical food preservation methods	
	L.O3 Perform food bioprocessing techniques (fermentation)	
	MANFA8508 MAINTAIN NUTRITIONAL QUALITY OF RAW / PROCESSED AGRICULTURAL PRODUCTS	
	L.O1 Identify factors affecting the nutritional quality of food (Identify nutritional risk factors)	
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	L.O3 Assess food products in meeting nutrient needs	
	L.O4 Recommend diet plan/product based on dietary needs/requirements using suitable tools	
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1. Introduction

Creating a political program for the continuing education reforms the existing technical and vocational training in the country, making technical and vocational education training systems towards performance-based approach for education and training, and the curriculum is based competency on a national curriculum for implementation overall in countries.

The competency-based curriculum, which has provided industry approval, makes the education, vocational and technical education system widespread and meets the requirements for better skills for the Cambodian economy, both in the system and out of the system.

The Competency-Based Curriculum is a framework or detailed guideline for subsequent development of curriculum, master plan for courses, courses framework, course content, along with teaching methods, including academic and assessment resources for vocational and technical training institutions.

Competency-based curriculum reflects a unified standard by validation from industry sector or community certification and approval from industry advisory group (IAG).

While competency standards have been developed and promulgated, this competency standard is used to develop a master plan and subsequent learning course for formal vocational and technical education programs.

The development of a competency-based curriculum is complicated and challenging, as it is the first step in building and developing a study approach and assessment for course design.

Competency-based curriculum is used to support alternative training strategies:

- Traditional teaching that students grow together through subject-matter courses or modules (course framework)
- Self-study is used by some training institutions
- Dual Training system
- Training in the workplace
- Recognition of Prior Learning) RPL(

With a variety of training and evaluation processes using the Competency Based Training approach, it is a methodology that focuses on learning outcomes and performance benchmarks based on requirements and standards set in the workplace.

The process of developing a competency-based curriculum, involves stakeholders from industry (technical or specialized specialist), curriculum developers, and professors or trainers with experiences in the skill or industry that develop a competency based curriculum.

The Curriculum Development Team has configured the Competency-Based Curriculum, that the training results and competency assessments for the whole course are linked to industrial standards. Preparing each units of competency, which is included in the National Competency Standards into Modules, allows us to measure in part its competency to go with the training module.

Some additional modules related to the occupations that are included in the training are developed, which support the implementation of all available competencies in the course, for example, modules that relate to materials or process work or measurement process. These modules may be related to additional knowledge, skills and attitude related to one or more of the competency which

are included in the Competency-Based Curriculum. The competency can involve various modules for training that the competency needs to develop skills and standards that students or trainees need to achieve.

The competency-based curriculum developed and promulgated can help master plan and course framework as shown in Annexes 1 and 2 in each curriculum. The Master Plan and Course Framework are designed for the formal training program in line with the Cambodian Qualifications Framework, integrating all the basic competencies and core competencies contained in the competency-based curriculum, which must be approved by the Industrial Advisory Group and approved and promulgated by the National Training Board.

In the course framework, there are some occupational skills related to the general competencies, which are essential for developing individualized knowledge, skills and attitude in performance processes that are fundamental to helping achieve core competencies and to improve analytical competency and working capacity.

2. National qualifications framework

The establishment of the National Qualifications System for Cambodia requires the acceptance of the Cambodian Qualifications Framework, which provides a holistic framework for integrating further education and training and other sub-sectors.

Qualification framework as a tool for national development and classification of qualifications according to the criteria of the levels reached, as well as policies and strategies to ensure the quality of education and training that make learning outcomes are standard and is widely recognized in the national and international community.

Under the terms of the Cambodia qualification framework, the qualifications provided in the Technical and Vocational Education and Training sector are based on the achievement of industry-standard competency responsiveness. The competencies defined in specific qualifications is part of the job that can make a person or worker get a job after they have achieved all the competency set at the qualification level.

Therefore, completing specific competency at a certain level of the individual or a worker will ensure to the industry that the person has the competency to perform certain tasks or jobs in line with industry standards.

Qualifications for Technical and Vocational Education and Training which are defined in the of Cambodia qualifications framework include:

- Vocational Certificate
- Technical and Vocational Certificate1
- Technical and Vocational Certificate2
- Technical and Vocational Certificate3
- Higher Diploma of Technology/Business Education
- Bachelor of Technology/Business Education
- Master Degree of Technology/Business Education
- Doctoral Degree of Technology/ Business Education

3. Competency-based curriculum

This section detailed the competency based curriculum on “**Installation and Maintenance of Agro Processing and Analysis Level 5**”.

COURSE DESIGN

Course Title	:	Installation and Maintenance of Agro Processing and Analysis System
Nominal Duration of the Course	:	1665 hours
Qualification Level	:	High Diploma
Unit of Competency	:	

1. Basic Competencies

1. Supervise application of key communication skills in the workplace
2. Supervise development of teams & individuals
3. Supervise problem solving techniques in the workplace
4. Supervise compliance with procedures, specifications, and manuals
5. Supervise preparation, use and maintenance of tools and equipment
6. Supervise interpretations of technical drawings, plans and mathematic calculations
7. Supervise OHS work issues in the Construction Industry
8. Supervise data collection and analysis in the workplace
9. Plan & organize work for several work teams
10. Supervise environmental protection implementation
11. Apply gender & social equity principles & policies

2. Core Competencies

1. Perform Pneumatic installation and maintenance
2. Perform electrical installation
3. Perform Electronics service for Agro Processing and Analysis
4. Perform CAD and mechanical technology for Agro Processing and Analysis
5. Setup drives and motor control for Agro Processing and Analysis
6. Perform automation and basic robotics
7. Install PLC and Sensors system
8. Perform Hydraulics installation and maintenance

Course Description:

This course is designed to develop the knowledge, skills, and attitude of an individual in the field of Manufacturing automation in accordance with industry standards. It covers basic competencies such as:

- Supervise application of key communication skills in the workplace
- Supervise development of teams & individuals
- Supervise problem solving techniques in the workplace
- Supervise compliance with procedures, specifications, and manuals
- Supervise preparation, use and maintenance of tools and equipment
- Supervise interpretations of technical drawings, plans and mathematic calculations
- Supervise OHS work issues in the Construction Industry
- Supervise data collection and analysis in the workplace
- Plan & organize work for several work teams
- Supervise environmental protection implementation

and Apply gender & social equity principles & policies. It also includes core competencies like:

- Supervise development of teams & individuals
- Supervise problem solving techniques in the workplace
- Supervise compliance with procedures, specifications, and manuals
- Supervise preparation, use and maintenance of tools and equipment
- Supervise interpretations of technical drawings, plans and mathematic calculations
- Supervise OHS work issues in the Construction Industry
- Supervise data collection and analysis in the workplace
- Plan & organize work for several work teams
- Supervise environmental protection implementation
- Apply gender & social equity principles & policies

Completion of this training course and passing the equivalent competency assessment will qualify the individual to become Agro Processing and Analysis Assistant level 5.

Student/Trainee Entry Requirements:

Student/trainee should possess the following requirement:

1. Have completed Technical-Vocational Certificate level 4
2. Passed entrance examination
3. Physically and mentally fit,
4. Can perform basic mathematical computations,
5. Can communicate both orally and in written form, and
6. With good moral character.

Course Structure:**BASIC COMPETENCIES**

(330 hours)

Unit of Competency	Module Title	Learning Outcomes	Nominal Duration
1. Supervise application of key communication skills in the workplace	1.1 Supervising application of key communication skills in the workplace	1.1.1 Meet common and specific communication needs of clients and colleagues 1.1.2 Contribute to the development of communication strategies 1.1.3 Represent the organization 1.1.4 Facilitate group discussion 1.1.5 Conduct interviews	30 hrs.
2. Supervise development of teams & individuals	2.1 Supervising development of teams & individuals	2.1.1 Supervise team leadership development 2.1.2 Foster individual and organizational growth 2.1.3 Monitor and evaluate workplace learning 2.1.4 Develop team commitment and cooperation 2.1.5 Facilitate accomplishment of organizational goals	30 hrs.
3. Supervise problem solving techniques in the workplace	3.1 Supervising problem solving techniques in the workplace	3.1.1 Analyze the problem 3.1.2 Identify the possible solution 3.1.3 Recommend solution to teams or higher management 3.1.4 Implement & Supervise Solution 3.1.5 Monitor outcomes	30 hrs.
4. Supervise data collection and analysis in the workplace	4.1 Supervising data collection and analysis in the workplace	4.1.1 Study information requirements 4.1.2 Process Data collected 4.1.3 Analyse, interpret and organize information gathered 4.1.4 Present findings, recommendations	30 hrs.
5. Plan & organize work for several work teams	5.1 Planning & organizing work for several work teams	5.1.1 Set objectives 5.1.2 Plan and schedule work activities 5.1.3 Implement work plans 5.1.4 Monitor work activities 5.1.5 Evaluate works plans & activities	30 hrs.
6. Supervise environmental protection implementation	6.1 Supervising environmental protection implementation	6.1.1 Adopt environmental protection policy & principles 6.1.2 Implement specific environmental programs. 6.1.3 Monitor activities on environmental protection	30 hrs.

		/programs	
7. Supervise OHS work issues in the construction industry	7.1 Supervising OHS work issues in the construction industry	7.1.1 Risk identification 7.1.2 Risk assessment 7.1.3 Risk prevention & supervision 7.1.4 Emergency procedures	30 hrs.
8. Apply gender & social equity principles & policies	8.1 Applying gender & social equity principles & policies	8.1.1 Follow guidelines or rules of conduct related to gender and social equity in the workplace 8.1.2 Contribute to improve workplace guidelines in promoting gender and social equity 8.1.3 Recognize and report suspected cases of gender and other forms of social inequity	30 hrs.
9. Supervise compliance with procedures, specifications, and manuals	9.1 Supervising compliance with procedures, specifications, and manuals	9.1.1 Review Standard Operating Procedure (SOP's), specifications & manuals. 9.1.2 Interpret compliance of SOP, manuals & specifications 9.1.3 Recording & reporting	30 hrs.
10. Supervise preparation, use and maintenance of tools and equipment	10.1 Supervising preparation, use and maintenance of tools and equipment	10.1.1 Supervise planning of resource requirements 10.1.2 Supervise requisition & acceptance of resources	30 hrs.
11. Supervise interpretation of technical drawings, plans and mathematic Calculations	11.1 Supervising interpretation of technical drawings, plans and mathematic Calculations	11.1.1 Analyze signs, symbols and data 11.1.2 Interpret technical drawings and work plans 11.1.3 Approve drawings & plans	30 hrs.

CORE COMPETENCIES

(1665 Hours)

Unit of Competency	Module Title	Learning Outcomes	Nominal Duration
1. Perform Pneumatic installation and maintenance	1.1. Performing Pneumatic installation and maintenance	1.1.1 Perform preventive maintenance on compressed-air distribution system 1.1.2 Install basic pneumatic control system 1.1.3 Perform preventive maintenance on basic pneumatic control system 1.1.4 Troubleshoot basic pneumatic control system 1.1.5 Develop basic pneumatic control system	180hours
2. Perform electrical installation	2.1 Performing electrical installation	2.1.1 Install single phase circuit 2.1.2 Install trunking or conduit 2.1.3 Test single phase installation 2.1.4 Perform system wiring in a control panel	180hours
3. Perform Electronics service for Agro Processing and Analysis	3.1 Performing Electronics service for Agro Processing and Analysis	3.1.1 Perform checks on resistors, capacitors and inductors 3.1.2 Perform checks on diodes 3.1.3 Perform in-circuit measurement on electronic circuit 3.1.4 Perform checks on BJT 3.1.5 Perform functional test on basic logic gate 3.1.6 Design logic circuit 3.1.7 Perform functional test on flip flops	180hours
4. Perform CAD and mechanical technology for Agro Processing and Analysis	4.1 Performing CAD and mechanical technology for Agro Processing and Analysis	4.1.1 Maintain safety and health of the individual 4.1.2 Interpret engineering drawings, create orthographic and isometric drawings 4.1.3 Create 3D engineering models 4.1.4 Perform linear and angular measurements 4.1.5 Produce circular holes and	180hour

		<p>thread cutting</p> <p>4.1.6 Fabricate work piece</p> <p>4.1.7 Perform assembly alignment and leveling of mechanical modules and machine</p> <p>4.1.8 Perform simple commissioning of systems</p> <p>4.1.9 Service and maintenance of machine components</p>	
5. Setup drives and motor control for Agro Processing and Analysis	5.1 Setting drives and motor control for Agro Processing and Analysis	<p>5.1.1 Install AC motor and motor controller</p> <p>5.1.2 Maintain installed AC motor</p> <p>5.1.3</p> <p>5.1.4 Troubleshoot AC motor & its controller</p> <p>5.1.5 Install DC motor and controller</p> <p>5.1.6 Maintain installed DC motor</p> <p>5.1.7 Troubleshoot DC motor and its controller</p>	180hours
6. Perform automation and basic robotics	6.1 Performing automation and basic robotics	<p>6.1.1 Install PLC system Configure robot to perform routine/specific tasks</p> <p>6.1.2 Load program to interface robot with external I/O devices</p> <p>6.1.3 Test robot control program</p> <p>6.1.4 Perform maintenance of automation system</p>	180 hours
7. Install PLC and Sensors system	7.1 Installing PLC and Sensors system	<p>7.1.1 Install PLC system hardware</p> <p>7.1.2 Program executable PLC</p> <p>7.1.3 Develop sequential program</p> <p>7.1.4 Interface sensors to devices</p> <p>7.1.5 Troubleshoot PLC controlled automated system</p> <p>7.1.6 Set up a Human Machine Interface (HMI) System</p>	180hours

8. Perform Hydraulics installation and maintenance	8.1 Performing Hydraulics installation and maintenance	8.1.1 Install hydraulic controlled system 8.1.2 Troubleshoot hydraulic system	75hours
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	installation and maintenance																
2.	Perform electrical installation						x	x	x	x							
3.	Perform Electronics service for Agro Processing and Analysis											x	x	x	x	x	x

Table 2: Core Competencies (Continued...)

No.	UNIT OF COMPETENCY	MODULE																		
		1 7	1 8	1 9	2 0	2 1	2 2	2 3	2 4	2 5	2 6	2 7	2 8	2 9	3 0	3 1	3 2	3 3	3 4	3 5
4.	Perform Pneumatic installation and maintenance	x	x	x	x	x	x	x	x	x										
5.	Setup drives and motor control for Agro Processing and Analysis											x	x	x	x	x	x			
6.	Perform automation and basic robotics																x	x	x	x

Table 2: (Competency Analysis continued....)

No	UNIT OF COMPETENCY	3 6	3 7	3 8	3 9	4 0	4 1	4 2	4 3
		7.	Install PLC and Sensors system	x	x	x	x	x	x
8.	Perform Hydraulics installation and maintenance							x	x

Assessment:

1. Oral questioning test

2. Written test/Theoretical exam
3. Practical workshop/workplace test
4. Direct observation while the task is being performed

Principle of Course Delivery:

The delivery of training should adhere to the design of the competency-based curriculum. Delivery should be guided by the 10 basic principles of a competency-based approach to TVET.

- The training is based on a curriculum developed from the competency standards;
- Learning is modular in its structure;
- Training delivery is individualized and self-paced;
- Training is based on work that must be performed;
- Training materials are directly related to the competency standards and the competency-based curriculum;
- Assessment is based in the collection of evidence of the performance of work to the industry-required standards;
- Training is based both on and off-the-job components
- Allows for recognition of prior learning (RPL) or current competencies
- Training allows for multiple entry and exit; and
- Approved training programs are Nationally Accredited

Recommended course delivery may include a combination of the following:

1. School-based Training
2. On-the-job training/Internship training
3. Dual training

Resources:

Materials:

1. Electrical wire	14. Vero board	29. Syrine for lubricant
2. Crimp terminal	15. Bolt	30. Lubricant bottle
3. Pneumatic air hose	16. Nut	
4. Y crimp terminal	17. Screw	
5. Bolt nut	18. Lubricant and oil	
6. Resistor (0.1Ω - 10 kΩ)	19. Overload relay	
7. Capacitor (10 μF - 220 μF)	20. Timer relay	
8. Solder	21. Electromechanical relay	
9. Solder	22. Fuse	
10. IC 4017	23. Tags	
11. IC Socket	24. Connection terminal	
12. IC 4776	25. Spiral wrap	
13. Workpiece	26. Cable tie	
1.	27. Component stand	
	28. Trunk/Conduit	

Tools

1. Philip screwdriver	15. Soldering vacuum
2. Flat screwdriver	16. File

3. Tubing cutter	17. Magnifier with stand and LED
4. Long nose plier	18. Steel rule
5. Combination plier	19. Measuring tape
6. Allen Key Set	20. Tap and die
7. spanner set	21. Hacksaw
8. Crimper	22. Hammer
9. Isolation remover	23. Grinder
10. Electrical testing pen	24. Spanner with handle
11. Vice	25. Block gauges
12. Vice table	26. Cutter
13. Vernia caliper	27. USB flash
14. Micrometer	28. Air manifold

Equipment :(machines/training simulator)

A. Machines:

1. Air-Compressor set 3 hp 200L	17. Function generator
2. Air dryer	18. IC tester
3. Air Blow Gun	19. Computer set with CAD software
4. Hand drill	20. Printer
5. Power drill	21. Smart screen
6. Digital multimeter	22. Slip ring motor
7. Ground tester	23. Cage motor
8. Isolation tester	24. Capacitor start motor
9. Digital oscilloscope	25. AC motor driver
10. DC Power supply	26. Shunt DC motor
11. AC Power supply	27. Series DC motor
12. Digital multimeter benchtop	28. Compound DC motor
13. Grinder motor	29. Stepper motor
14. Pneumatic bolt driver	30. Dynamical brake
15. Infrared temperature tester	31. Re-generative brake
16. Vibration tester	32. Plug ring brake
	33. DC motor driver
	34. Air filter
	35. Computer set with robotic software
	36. Dust vacuum machine.
	37. Computer set with PLC software

B. Training simulator:

1. Electrical box for electrical installation	6. PLC training set
2. Logic and IC testing board	7. Pneumatic and Electro-pneumatic training set
3. Control box for motor	8. Sensor training set
	9. HMI training set

4. Industrial robot with simulation software 5. Water level emulator	10. Hydraulic & Electro-Hydraulic training set
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C. Personal Protective Equipment (PPE)

<ol style="list-style-type: none"> 1. Safety hat 2. Safety shoe 3. Safety goggle 4. Safety vase 5. Safety gloves 6. Leather apron

Service Information (Be used in workplace/workshop)

1. Service Manual / Shop manual
2. Manufacturer's manual / factory manual
3. Specialized manual
4. General repair manual
5. Service manual Illustrations
6. Service publications
7. Computerized Service Data

Qualification of Instructors/Trainers:

1. Must be a holder of relevant high diploma/Bachelor Degree
2. Must have completed pedagogy program
3. Must have 3 years of teaching experience
4. Must have good command of the English language
5. Must have relevant practical work experience
6. Must be computer literate
7. Must have good interpersonal skill
8. Physically and Mentally fit
9. Good moral character

**MODULES OF INSTRUCTION
CORE COMPETENCIES**

**FOOD PROCESSING AND ANALYSIS
HIGH DIPLOMA
(LEVEL 5)**

MODULES OF INSTRUCTION (1)
CORE COMPETENCIES

Course title : FOOD PROCESSING AND ANALYSIS
Unit of Competency : PERFORM BASIC MEASUREMENTS AND CALIBRATION
TECHNIQUES IN THE LABORATORY
Module Title : PERFORMING BASIC MEASUREMENTS AND
CALIBRATION : TECHNIQUES IN THE LABORATORY

Module Descriptor :

This module covers the outcomes required to perform basic laboratory techniques / measurements and carry out basic calibration of laboratory instruments to ensure accurate and reliable experimental data / results. In addition, coverage of key chemistry concepts, laboratory safety, waste management and data organization will also be included to support execution of laboratory activities performed in a chemical laboratory.

Level of Certification: High Diploma

Nominal Duration : 180 hrs

Learning Outcomes :

Upon completion of this module, the students/trainees should be able to:

- LO1. Identify chemical compounds
- LO2. Prepare chemical solutions of known concentrations
- LO3. Perform calibration of testing / measuring instruments
- LO4. Perform basic laboratory measurements / techniques (length, weight, volume, pH, temperature)
- LO5. Perform data and unit conversion

LO1. Identify chemical compounds

Assessment Criteria:

1. Appropriate basic drawing techniques are applied.
2. Correct identification test(s) and appropriate reagent(s) to identify ions / functional groups in unknown solutions/compounds are selected
3. Suitable personal protective equipment (PPE) is worn for the intended activities
4. Qualitative analyses are carried out in accordance with established procedures
5. Observations of reactions are correctly recorded, and the associated unknown compounds are correctly identified.
6. Workstation is cleaned and laboratory apparatus are returned to the proper storage location
7. Proper housekeeping and waste management procedures are followed in compliance with organizational and legislative requirements

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the classification of the periodic table
- 1.2 Explain the application of the periodic table in inorganic chemistry, including:
 - Electronic configuration
 - Valency of elements
 - Electronegativity and polarity
- 1.3 Explain atomic structure and the relationship between atoms and molecules
- 1.4 Derive chemical formula of compounds
- 1.5 Explain the classification of bonding
 - Ionic
 - Covalent
 - Hydrogen
- 1.6 Describe the chemical formula and chemical names of different compounds
- 1.7 Describe the functions and properties of various functional groups in organic compounds
- 1.8 Describe the nomenclature of organic compounds
- 1.9 Explain the functions of common reagents used in the identification of organic compounds
- 1.10 Explain common terms used for chemical equations
- 1.11 Explain the concept of stoichiometry
- 1.12 Explain the relationship between balanced chemical equations, stoichiometric factors and quantities of reactants and products
- 1.13 List common types of chemical reactions
- 1.14 Explain the rationale and importance of GLP
- 1.15 Explain the primary areas covered by GLP
 - Laboratory safety
 - Chemicals and reagents
 - Cleaning of glassware
 - Distilled or reagent water
 - Measurement
 - Recording of data
 - Waste disposal

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Use concepts of organic / inorganic chemistry to explain composition, structure, properties, reactivity of chemical substances
- 3.2 Apply principles of different chemical reactions to carry out laboratory tasks involving both qualitative and quantitative tests / analyses
- 3.3 Apply good housekeeping when working in the laboratory
- 3.4 Apply principles relating to occupational safety and health (OSH) when performing laboratory tasks / activities
- 3.5 Carry out laboratory works that are in line with GLP to generate reliable and high-quality test data
- 3.6 Manage laboratory wastes in accordance with established procedures to optimize safety and minimize environmental impact

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 1

A. Tools

No.	Description	Unit	Quantity
1.	Reagent dispenser	units	4
2.	Chemical spillage kit (small capacity)	sets	2
3.	Stop-watch	pcs	5
4.	Thermometer	sets	5
5.	Tripod stand	pcs	10

B. Equipment

No.	Description	Unit	Quantity
1.	Shaking water bath	sets	5
2.	Heating mantle	sets	5
3.	Hot plate with magnetic stirrer	sets	8
4.	DI water system	unit	1
5.	Boiling bath	units	4
6.	Laboratory Apparatus (Set A)	sets	10

7.	Beakers	sets	10
8.	test tubes	sets	20
9.	test tube racks	sets	5
10.	measuring cylinders	sets	10
11.	Pasteur pipettes	sets	10
12.	conical flasks	sets	10
13.	funnels	sets	5
14.	stirring rods	sets	5
15.	weighing boats	sets	5
16.	reagent bottles	sets	5
17.	retort stands	sets	5

C. Materials

No.	Description	Unit	Quantity
1.	Chemical (reagents, organic / inorganic compounds, solvent, acid, acid, alkali)	sets	10
2.	RO / DI water (in plastic wash bottles)	sets	5
3.	Molecular model kits	sets	10
4.	Periodic table	sets	20
5.	Safety data sheets	sets	10
6.	អាវមន្តិរពិសោធន៍ (lab coat)	Set	20
7.	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
8.	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
9.	តុលាមន្តិសុវត្ថិភាព (Safety gloves)	Pair	20
10.	ដំនាតសុវត្ថិភាព (Safety goggles)	Pair	20
11.	ប្រដាប់ចិញ្ចៀត (Ear plug)	Pair	20
12.	តុលាមន្តិការពារកំដៅ (Thermal gloves)	Pair	20
13.	តុលាមន្តិ (vinyl gloves or PE gloves)	Box	1
14.	ម៉ាស៊ីន (Face mask)	Box	1
15.	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
16.	តុលាមន្តិដៃ (Protective sleeve)	Pair	20
17.	អាវមន្តិរពិសោធន៍ (lab coat)	Set	20

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1.	Handouts	sets	20
2.	Laptop	unit	1
3.	Projector (LCD 220volt, 50/60HZ)	unit	1
4.	Projection screen, portable type, big size	unit	2
5.	White board, portable	unit	2
6.	Laser pointer	unit	2
7.	Whiteboard marker (black)	pcs	2
8.	Whiteboard marker (blue)	pcs	2
9.	Permanent marker (red)	pcs	2

10.	Whiteboard Eraser	unit	1
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Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO2. Prepare chemical solutions of known concentrations

Assessment Criteria:

1. Relevant information on chemicals used for preparation of solutions are correctly interpreted
2. Suitable personal protective equipment (PPE) is worn for the intended activities
3. Correct mathematical operation is performed to derive the required amount/quantity and concentration of chemical
4. Appropriate measuring equipment, glassware and tool(s) are selected
5. Chemical solutions of the required specifications are prepared in accordance with established procedures for solution preparation
6. Prepared chemical solutions are labelled with the required information
7. Workstation is cleaned and laboratory apparatus are returned to the proper storage location
8. Proper housekeeping and waste management procedures are followed in compliance with organizational and legislative requirements

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the terms solute, solvent, solution
- 1.2 Explain the good practices of solution preparation
- 1.3 Explain the different expressions for the concentration of solutions, which may include:
 - Moles
 - Molarity
 - Molality
 - Normality
 - %(v/v)
 - %(w/v)
 - %(w/w)
 - ppm
 - ppb
 - Dilution factor
- 1.4 Explain the concept of acid-base titration
- 1.5 Explain the use of unit prefixes, significant figures and scientific notation in measurements.

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

(all are in LO1)

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 2

A. Tools

No.	Description	Unit	Quantity
1.	Thermometer	sets	5
2.	Calculator	sets	20
3.	Beakers	sets	10
4.	test tubes	sets	10
5.	test tube racks	sets	10
6.	measuring cylinders	sets	10
7.	pasteur pipettes,	sets	10
8.	conical flasks	sets	10
9.	funnels	sets	10
10.	stirring rods	sets	10
11.	weighing boats	sets	10
12.	reagent bottles	sets	10
13.	retort stands	sets	10
14.	Graduated and volumetric pipettes, ,	sets	10
15.	volumetric flasks	sets	10
16.	burettes	sets	10
17.	Thermometer	sets	5
18.	Calculator	sets	20

B. Equipment

No.	Description	Unit	Quantity
1.	Shaking water bath	sets	5
2.	Heating mantle	sets	5
3.	Hot plate with magnetic stirrer	sets	5
4.	Precision weighing balance - 2 decimal points - up to 2200g - inclusive of calibration weights	units	4
5.	Analytical weighing balance - up to 220 g - 4 decimal points - inclusive of calibration weights	units	4
6.	DI water system	unit	1

C. Materials

No.	Description	Unit	Quantity
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1.	Chemical (reagents, organic / inorganic compounds, solvent, acid, acid, alkali)	sets	10
2.	RO / DI water (in plastic wash bottles)	sets	5
3.	Molecular model kits	sets	10
4.	Periodic table	sets	20
5.	Safety data sheets	sets	10
6.	អាវមន្ទីរពិសោធន៍ (lab coat)	Set	20
7.	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
8.	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
9.	តុលាមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
10.	រ៉ឺម៉កសុវត្ថិភាព (Safety goggles)	Pair	20
11.	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
12.	តុលាមដៃកំដៅ (Thermal gloves)	Pair	20
13.	តុលាមដៃ (vinyl gloves or PE gloves)	Box	1
14.	ម៉ាសក្រមុំ (Face mask)	Box	1
15.	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
16.	តុលាមដៃដីង (Protective sleeve)	Pair	20
17.	អាវមន្ទីរពិសោធន៍ (lab coat)	Set	20

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1.	Handouts	sets	20
2.	Laptop	unit	1
3.	Projector (LCD 220volt, 50/60HZ)	unit	1
4.	Projection screen, portable type, big size	unit	2
5.	White board, portable	unit	2
6.	Laser pointer	unit	2
7.	Whiteboard marker (black)	pcs	2
8.	Whiteboard marker (blue)	pcs	2
9.	Permanent marker (red)	pcs	2
10.	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO3. Perform calibration of testing / measuring instruments

Assessment Criteria:

1. Established standard operating procedure (SOP) for calibration is followed
2. Laboratory safety procedure, including donning proper personal protective equipment (e.g., lab coats, goggles, covered shoes, long pants) is followed
3. Appropriate apparatus / equipment and standards are selected and prepared in accordance with established procedures
4. Checks and adjustments are performed prior to calibration
5. Testing instruments are calibrated in accordance with established procedures
6. Calibration data are compared against the acceptable criteria for calibration to assess if instrument is "Out of Specification"
7. Appropriate corrective action(s) to the deviation in calibration results is/are proposed
8. Calibration records (log, form and tag) are accurately completed in an approved format and submitted to authorized personnel for verification
9. Workstation is cleaned and laboratory apparatus are returned to the proper storage location
10. Proper housekeeping and waste management procedures are followed in compliance with organizational and legislative requirements

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the concept of calibration and the common errors encountered during the calibration process of different types of equipment such as pH meter, weighing scale, thermometer
- 1.2 State appropriate corrective actions to deviations in calibration results
- 1.3 Explain the factors affecting pH measurement
- 1.4 Explain the relationship between pH and pOH values and concentrations of hydronium and hydroxide ions
- 1.5 Describe the various components of a pH meter and its associated functions
- 1.6 Describe the different types of pH probes and their application
- 1.7 Explain the concept of calibration and the common errors encountered during the calibration process of different types of equipment such as pH meter, weighing scale, thermometer
- 1.8 Explain the principles of measurement of physical properties:
 - Mass
 - Volume
 - Length
 - Temperature
 - pH
- 1.9 Explain the relationship between mass, density and volume
- 1.10 Describe the different types of laboratory apparatus and their application in measuring physical properties, such as temperature, pH, volume, weigh (e.g., weighing balance, pycnometer, volumetric pipettes, graduated pipette, thermometer, pH meter, etc)
- 1.11 Explain the concept of accuracy and precision
- 1.12 Explain the rationale and importance of GLP
- 1.13 Explain the primary areas covered by GLP
 - Laboratory safety
 - Chemicals and reagents

- Cleaning of glassware
- Distilled or reagent water
- Measurement
- Recording of data
- Waste disposal

1.14 State common units of measurement used in the laboratory

1.15 Explain how data and unit conversion are carried out

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Apply laboratory skills and techniques that are essential to improving accuracy of test results / outcomes
- 3.2 Apply appropriate corrective actions when errors / deviations occur for various laboratory tasks i.e., measurement, calibration, data recording, etc.

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 3

A. Tools

No.	Description	Unit	Quantity
1.	ម៉ែត្រ pH (inclusive of ion selection electrodes)	Set	4
2.	ទែម៉ូម៉ែត្រ	Set	10
3.	មីក្រូពីប៉េត (Micropipette)	Piece	10
4.	ឧបករណ៍វាស់ប្រវែងប្រភេទ Vernier caliper	Piece	10
5.	ឧបករណ៍វាស់ប្រវែងប្រភេទ Micrometer	Piece	10
6.			
7.	ជញ្ជីង (weighing balance)	Piece	5
8.	កែវបរិស័រ (Beaker)	Piece	10
9.	បំពង់កែវ test tubes	Piece	10

10.	ឡូត៍ដាក់បំពង់កែវ test tube (test tubes racks)	Piece	10
11.	ស៊ីឡាំងវាស់)measuring cylinders(Piece	10
12.	បំពង់ប៉ាស្ទ័រ (pasteur pipettes)	Set	10
13.	កែវ conical flasks	Piece	10
14.	ឡូត៍ (funnels)	Piece	10
15.	ខ្នុរ (stirring rods)	Piece	10
16.	ធានឆ្នឹង (weighing boats)	Set	10
17.	ដបដាក់សារធាតុគីមី (reagent bottles)	Piece	10
18.	ជើងឡូត៍ (retort stands)	Piece	10
19.	ឧបករណ៍បូមកាមក្រិត (Graduated and volumetric pipettes)	Piece	10
20.	កែវ volumetric flasks	Piece	10
21.	បំពង់ក្រិត សម្រាប់ទឹកក្រូត (burettes)	Piece	10

B. Equipment

No.	Description	Unit	Quantity
1.	ឧបករណ៍ប្រព័ន្ធទឹកប្រើក្នុងមន្ទីរពិសោធន៍ (DI water system)	unit	1
2.	ធុងឆ្នឹង (Precision weighing balance) - decimal points - up to 2200g	units	4
3.	ធុងវិភាគ (Analytical weighing balance) - up to 220 g - 4 decimal points	units	4
4.	ឆ្នាំងកំដៅ (Shaking water bath)	units	2

C. Materials

No.	Description	Unit	Quantity
1.	ទឹកតម្រូវ pH (pH buffer standards)	Set	10
2.	ក្រដាសអនាម័យសើម (Paper tissues / wipes)	Box	25
3.	ក្រដាសអនាម័យស្ងួត (Kimwipe)	Box	25
4.	ទឹកបិទដោយប្រព័ន្ធ RO / DI (RO / DI water (in plastic wash bottles)	ដប	10
5.	ស្តង់ដារស្រួលស្រាបសម្រាប់ត្រួតពិនិត្យ (Calibration standards)	Set	10
6.	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
7.	ម៉ាស៊ីន (Face mask)	Box	1
8.	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
9.	ម៉ាស់ (N3 Mask)	Box	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1.	Handouts	sets	20
2.	Laptop	unit	1
3.	Projector (LCD 220volt, 50/60HZ)	unit	1
4.	Projection screen, portable type, big size	unit	2
5.	White board, portable	unit	2
6.	Laser pointer	unit	2
7.	Whiteboard marker (black)	pcs	2
8.	Whiteboard marker (blue)	pcs	2
9.	Permanent marker (red)	pcs	2
10.	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO4. Perform basic laboratory measurements / techniques (length, weight, volume, pH, temperature)

Assessment Criteria:

1. Established standard operating procedure (SOP) for laboratory measurement is followed
2. Laboratory safety procedure, including donning proper personal protective equipment (e.g., lab coats, goggles, covered shoes, long pants) is followed
3. Suitable apparatus / equipment for the measurement are selected
4. Measurement is performed in accordance with established procedures and measurement data are correctly recorded.
5. Data entry / correction is performed in accordance with established procedure and good documentation practice
6. Appropriate corrective action(s) is/are carried out in accordance with good documentation practice when error occurs for data entry
7. Data entered are verified by authorized personnel
8. Workstation is cleaned and laboratory apparatus are returned to the proper storage location
9. Proper housekeeping and waste management procedures are followed in compliance with organizational and legislative requirements.

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the use of unit prefixes, significant figures and scientific notation in measurements

1. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

2. Skill includes the following:

- 3.1 Use calibration procedures and appropriate criteria for acceptance to assess the functionality of laboratory apparatus / equipment
- 3.2 Use / operate laboratory apparatus / equipment for the intended purposes, and carry out steps that conform to the user manuals / guides

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 4

A. Tools

No.	Description	Unit	Quantity
1	ម៉ែត្រ pH (inclusive of ion selection electrodes)	Set	4
2	ឧបករណ៍វាស់ប្រវែងប្រភេទ Vernier caliper	Piece	10
3	មីក្រូពីប៉ែត (Micropipette)	Piece	10
4	Pycnometer	sets	5
៦	ឧបករណ៍វាស់ប្រវែងប្រភេទ Micrometer	Piece	10
៧	ឧបករណ៍វាស់ប្រវែងប្រភេទ Vernier caliper	Piece	10
៨	ជញ្ជីង (weighing balance)	Piece	5
៩	កែវបេស៊ែរ (Beaker)	Piece	10
10	បំពង់កែវ test tubes	Piece	10
11	ទម្រង់ដាក់បំពង់កែវ test tube (test tubes racks)	Piece	10
12	ស៊ីឡាំងវាស់ (measuring cylinders)	Piece	10
13	បំពង់ប៉ាស្ត័រ (pasteur pipettes)	Set	10
14	កែវ conical flasks	Piece	10
15	ទ្បាវ (funnels)	Piece	10
1៦	ខ្នុរ (stirring rods)	Piece	10
1៧	ទាតឡីង (weighing boats)	Set	10
1៨	ដបដាក់សារធាតុគីមី (reagent bottles)	Piece	10
1៩	ជើងទម្រម (retort stands)	Piece	10
20	ឧបករណ៍បូមតាមក្រិត (Graduated and volumetric pipettes)	Piece	10
21	កែវ volumetric flasks	Piece	10
22	បំពង់ក្រិត សម្រាប់មីក្រូត (burettes)	Piece	10

B. Equipment

No.	Description	Unit	Quantity
1	ឧបករណ៍ប្រព័ន្ធទឹកប្រើក្នុងមន្ទីរពិសោធន៍ (DI water system)	units	1
2	ជញ្ជីងឡីង (Precision weighing balance) - decimal points - up to 2200g	units	4
3	ជញ្ជីងវិភាគ (Analytical weighing balance) - up to 220 g - 4 decimal points	units	4

C. Materials

No.	Description	Unit	Quantity
1	ទឹកតម្រូវ pH (pH buffer standards)	Set	10
2	ក្រដាសអនាម័យសើម (Paper tissues / wipes)	Box	25
3	ក្រដាសអនាម័យស្ងួត (Kimwipe)	Box	25
4	ទឹកចម្រោះដោយប្រព័ន្ធ RO / DI (RO / DI water (in plastic wash bottles)	ដប	10
5	ស្តង់ដារសូលុយស្យុងសម្រាប់ច្បាស់កម្ម (Calibration standards)	Set	10
5	ទឹកតម្រូវ pH (pH buffer standards)	Set	10
6	អាវមន្ទីរពិសោធន៍ (Lab coat)	Set	20
7	រូបាមដៃ (vinyl gloves or PE gloves)	Box	1
8	ម៉ាសមុខ (Face mask)	Box	1
9	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
10	ម៉ាស់ (N3 Mask)	Box	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1.	Handouts	sets	20
2.	Laptop	unit	1
3.	Projector (LCD 220volt, 50/60HZ)	unit	1
4.	Projection screen, portable type, big size	unit	2
5.	White board, portable	unit	2
6.	Laser pointer	unit	2
7.	Whiteboard marker (black)	pcs	2
8.	Whiteboard marker (blue)	pcs	2
9.	Permanent marker (red)	pcs	2
10.	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO5. Perform data and unit conversion

Assessment Criteria:

1. Correct operation / formula is performed for unit conversion
2. Experimental data are expressed correctly with appropriate units of measurement, significant figures, decimal places and scientific notation.

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 State common units of measurement used in the laboratory
- 1.2 Explain how data and unit conversion are carried out

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Apply appropriate corrective actions when errors / deviations occur for various laboratory tasks i.e., measurement, calibration, data recording, etc.
- 3.2 Perform laboratory unit conversion from SI units to conventional units when performing calculations, expressing data according to requirements,

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 5

A. Tools

No.	Description	Unit	Quantity
1	Calculator	sets	20
2			
3			
4			

B. Equipment

No.	Description	Unit	Quantity
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1			
2			

C. Materials

No.	Description	Unit	Quantity
1	Worksheets	sets	20
2			
3			
4			
5			

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector	unit	1
4	Projection screen, portable type, big size	unit	1
5	White board, portable, 1.2m x 2.4m	unit	2
6	Laser pointer	unit	1
7	A4 paper	box	1
8	Whiteboard marker (blue, red, black and green)	pcs	4
9	Permanent marker (blue, black and red)	pcs	3
10	Flip chart	sheet	8

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

MODULES OF INSTRUCTION (2)
CORE COMPETENCIES

Course title : FOOD PROCESSING AND ANALYSIS
Unit of Competency : CONDUCT QUALITY CHECKS ON RAW / PROCESSED AGRICULTURAL PRODUCTS, FOOD INGREDIENTS AND PACKAGING MATERIALS
Module Title : CONDUCTING QUALITY CHECKS ON RAW / PROCESSED AGRICULTURAL PRODUCTS, FOOD INGREDIENTS AND PACKAGING MATERIALS

Module Descriptor :

This module covers the outcomes required to carry out quality checks on raw / processed agricultural products, food ingredients and packaging materials using suitable methods to assess their disposition and suitability for use / consumption; methods used for the quality checks include performing visual inspection, evaluating chemical and physical properties using suitable methods / equipment, conducting organoleptic assessment, etc. In addition, reference will be made to relevant legislative and regulatory standards to assess compliance with the set requirements.

Level of Certification: High Diploma

Nominal Duration : 180 hrs

Learning Outcomes :

Upon completion of this module, the students/trainees should be able to:

- LO1. Determine moisture content and water activity of food
- LO2. Identify suitable raw materials / ingredients for application in food products
- LO3. Conduct qualitative and quantitative checks on raw materials, processed / finished products, food ingredients and packaging materials
- LO4. Evaluate sensory properties/ characteristics of food products / ingredients
- LO5. Comply with food labelling requirements

LO1. Determine moisture content and water activity of food

Assessment Criteria:

1. Appropriate personal protective equipment (PPE) is donned in accordance with safety and hygiene requirements
2. Suitable methods, tools and apparatus / equipment for moisture content and water activity determination are selected and used
3. Test samples / apparatus / equipment are prepared in accordance with standard operating procedures (SOP)
4. Working condition of the equipment is checked against the calibration schedule, calibration records and/or maintenance records
5. Moisture / water activity is measured in accordance with standard operating procedures (SOP)
6. Test results is correctly recorded in a prescribed format
7. Moisture content of food products is correctly calculated
8. Test results of samples is correctly assessed and concluded with reference with established specifications for moisture and water activity
9. Proper housekeeping is carried out

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the relationship between moisture content and the quality of food products.
- 1.2 Explain the importance of equipment maintenance and calibration prior to measurement
- 1.3 Describe the moisture content of various types of food
- 1.4 Explain the difference between water activity and moisture content
- 1.5 Describe the procedures for conducting moisture test

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Use different methods to quantify moisture and water activity in raw materials, food ingredients and products
- 3.2 Relate measured moisture content and water activity value to product shelf stability, quality and safety

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities

5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 1

A. Tools

No.	Description	Unit	Quantity
1	ដេស៊ីកាទ័រ (Desiccators)	Piece	2
2	បានប៊ែសេរ៉ូស៊ីនជាមួយគំរូប (Porcelain Crucible)	Piece	10
3	ដង្កៀប (Tongs)	Piece	5
4	កែវបេស៊ែរ (Beaker)	Set	5
5	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
6	ពីប៉េត (Pipette)	Set	5
7	ដបទឹកបិត (squeeze bottle)	Set	5
8	ស្ពាបព្រាមន្ទីរពិសោធន៍ (lab spatula)	Set	5
9	សម្ភារៈផ្ទះបាយ (ប្រដាប់ ថាស កាំបិត ស្ពាបព្រា សម បាន កាំបិត ក្រន្ត ចង្កី ដក ដកដា ដង្កៀប កាំបិត) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ឡស្ងួត (dry oven)	Unit	1
2	ឧបករណ៍វាស់សមភាពទឹក (water activity meter)	Unit	1
3	ជញ្ជីងវិភាគ (analytical balance)	Unit	2
4	ម៉ាស៊ីនអុក្រាតូម (Karl Fischer titrators)	Unit	1
5	ម៉ាស៊ីនវាស់សំណើម (Moiturize Meter)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	បានអាលុយមីញ៉ូម (aluminum bowl)	Piece	1
2	អាវមន្ទីរពិសោធន៍ (lab coat)	Set	20
3	ស្បែកដើមសុវត្ថិភាព (Safety shoes)	Pair	20
4	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
5	ស្រោមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
6	ដំនាសុវត្ថិភាព (Safety goggles)	Pair	20
7	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
8	ស្រោមដៃកម្រិតកំដៅ (Thermal gloves)	Pair	20
9	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1

10	ម៉ាសមុខ (Face mask)	Box	1
11	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
12	ក្រសាយការពារដៃ (Protective sleeve)	Pair	20
13	សម្ភារសម្អាតផ្ទះ (កូនកំឡុង កំប៉ៅ: ប្រដាប់ជូតកំពល ក្នុងលាងទាន ព្រាស់ដុសកែវ សាប៊ូលាងទាន Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10
14	ទានអាលុយមីញ៉ូម (Aluminum Bowl)	Piece	1

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO2. Identify suitable raw materials / ingredients for application in food products

Assessment Criteria:

1. Suitable raw materials / food ingredients to achieve desired outcome(s) of food products are selected
2. Suitable quality assessment tools, instruments and equipment to assess / measure quality parameters of ingredients/ products are selected
3. Test procedures in accordance with standard operating procedures (SOP) are carried out
4. Observations and raw data are correctly recorded using appropriate forms
5. Proper housekeeping is carried out

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the key nutrients present in food, including carbohydrate, fat, protein, vitamin, mineral and water
- 1.2 Explain the different food groups and their subgroups
- 1.3 Describe the characteristics and functional properties of following nutrients in the various food groups:
- 1.4 Carbohydrate
- 1.5 Lipids
- 1.6 Protein
- 1.7 Explain the suitable tools, instrument and equipment that are used to measure the quality parameters of food products
- 1.8 Explain the importance of conducting raw material check
- 1.9 Describe the common food ingredients found in food products

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Identify suitable food groups and their products based on their functions, properties and characteristics for application in food development /production
- 3.2 Prepare and handle food ingredients correctly

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 2

A. Tools

No.	Description	Unit	Quantity
1	កែវបេស៊ែរ (Beaker)	Set	5
2	ប៊ូរ៉េត (Burette)	Piece	5
3	កែវកោណ (Erlenmeyer)	Set	5
4	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
5	បាឡុងក្រិត (Volumetric flask)	Set	5
6	ពីប៉ែត (កែវ 5 10 25 50 មីលីលីត្រ) (Glass Pipette 5,10,25,50 ml)	Set	5
7	ឧបករណ៍បូមពីប៉ែត (TBD) (Pipette Pumper)	Set	5
8	ដបដាក់សូលុយស្យុង (TBD) (Glass Bottle)	Set	5
9	ដីឡូរ (កែវ) (Glass funnel)	Set	5
10	ឧបករណ៍ត្រោះ (Funnel)	Set	5
11	ខ្លួម៉ាញ៉េទិច (Magnetic Stir Bar)	Set	5
12	ទែម៉ូម៉ែត្រ (អាល់កុល) (Alcohol Thermometer)	Piece	10
13	ទែម៉ូម៉ែត្រ (វាស់សាច់) (Meat Thermometer)	Piece	5
14	អ៊ីដ្រូម៉ែត្រ (Hydrometer)	Set	5
15	កាំប្រុងអង្កាម (Siever shaker)	Set	2
16	ស្លាបព្រាមឌីរីសោធន៍ (Lab Spatula)	Set	5
17	ដបទឹកចិត (Squeeze Bottle)	Set	5
18	សម្ភារៈផ្ទះបាយ (គ្រួញ ថាស កាំបិត ស្លាបព្រា សម ចាន កាំប្រុង កន្រ្តី ចង្កី ដក ដកតា ដង្កៀប កាំត្រី) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនវាស់រាងកាយ (texture analyzer)	Unit	1
2	រឺហ្វ្រាក់តូម៉ែត្រ (Refractometer)	Unit	2
3	ម៉ាស៊ីនវាស់បរិមាណអ៊ីយ៉ូត (salt meter)	Unit	1
4	ម៉ាស៊ីនវាស់ពណ៌ (Colorimeter)	Unit	1
5	ម៉ាស៊ីនស្ទិកត្រូ (Spectrophotometer)	Unit	1
6	ម៉ាស៊ីន pH ម៉ែត្រ (pH meter)	Unit	2
7	ម៉ាស៊ីនវាស់ភាពខាប់ (viscosity)	Unit	1

8	ជញ្ជីងវិភាគ (analytical balance)	Unit	2
9	ទូរទឹកកក (Refrigerator)	Unit	1
10	ម៉ាស៊ីនកូរ និងកំដៅ (Hot Plate)	Unit	5
11	ម៉ាស៊ីនវ័រតិច (Vortex)	Unit	5
12	ម៉ាស៊ីនក្រូឡុក (Blender/Homogenizer)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	pHស្តង់ដារ (pH standard Solution)	ដប	3
2	ធានអាឡូយ៉ូម (aluminum bowl)	Piece	10
3	ក្រដាសធ្លឹងទម្ងន់ (weighing paper)	Box	1
4	ក្រដាសត្រោះ (filter paper)	Box	1
5	ក្រដាសpH (pH test strips)	Box	1
6	Pairឥត (Cuvette)	Box	1
7	ធានអាឡូយ៉ូម (aluminum bowl)	Piece	1
8	អាវមន្ទីរពិសោធន៍ (lab coat)	Set	20
9	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
10	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
11	ត្រូវការសុវត្ថិភាព (Safety gloves)	Pair	20
12	កញ្ចក់សុវត្ថិភាព (Safety goggles)	Pair	20
13	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
14	ត្រូវការកំដៅ (Thermal gloves)	Pair	20
15	ត្រូវការវែន (vinyl gloves or PE gloves)	Box	1
16	ម៉ាស៊ីនមុខ (Face mask)	Box	1
17	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
18	ត្រូវការសម្លឹង (Protective sleeve)	Pair	20
19	សម្ភារសម្អាតទូទៅ (កូនក្រូម កំដៅ ប្រដាប់ជូតកំលាយ ជុំលាងចាន ត្រាស់ដុសកែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1.	Handouts	sets	20
2.	Laptop	unit	1
3.	Projector (LCD 220volt, 50/60HZ)	unit	1
4.	Projection screen, portable type, big size	unit	2
5.	White board, portable	unit	2

6.	Laser pointer	unit	2
7.	Whiteboard marker (black)	pcs	2
8.	Whiteboard marker (blue)	pcs	2
9.	Permanent marker (red)	pcs	2
10.	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO3. Conduct qualitative and quantitative checks on raw materials, processed / finished products, food ingredients and packaging materials

Assessment Criteria:

1. Types and quantity of incoming raw materials and ingredients are verified with reference to the relevant item requisition documents
2. relevant documents and certificates to determine if items meet safety standards and other compliance criteria are verified
3. Visual and physical checks for raw materials / ingredients / packaging materials are conducted
4. Delivery and storage conditions are checked to assess if they are appropriate for the raw materials and ingredients
5. Observations of the checks are recorded in a prescribed format
6. Incoming raw materials / ingredients / packaging are labelled with the correct, completed quality control (QC) labels/stickers before they are transferred for storage or segregation

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the use, selection and storage of various food groups
- 1.2 Explain factors affecting quality of food, including micro-organism and physical defects

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Identify non-conforming or non-complying conditions and characteristics of food that will have impact on food safety and quality

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 3

A. Tools

No.	Description	Unit	Quantity
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1	កែវបេស៊ែរ (Beaker)	Set	5
2	ប៊ូរ៉េត (Burette)	Piece	5
3	កែវកោណ (Erlenmeyer)	Set	5
4	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
5	បាឡូម៉ែត្រ (Volumetric flask)	Set	5
6	ពីប៉ែត (កែវ 5 10 25 50 មីលីលីត្រ)(Glass Pipette 5,10,25,50ml)	Set	5
7	ឧបករណ៍បូមពីប៉ែត (TBD) (Pipette Pumper)	Set	5
8	ដបដាក់សូលុយស្យុង (TBD) (Glass Bottle)	Set	5
9	ដីឡាវ (កែវ)(Glass Funnel)	Set	5
10	ឧបករណ៍ច្រោះ (Funnel)	Set	5
11	ខ្នុរម៉ាញ៉េទិច (Magnetic Stir Bar)	Set	5
12	ទែម៉ូម៉ែត្រ(អាល់កុល) (Alcohol Thermometer)	Piece	10
13	ទែម៉ូម៉ែត្រ(វាស់សាច់) (Meat Thermometer)	Piece	5
14	អ៊ីដ្រូម៉ែត្រ (Hydrometer)	Set	5
15	កម្រិតរំកិល (Siever shaker)	Set	2
16	ស្លាបព្រាមន្ទីរពិសោធន៍ (lab Spatula)	Set	5
17	ដបទឹកបិត (Squeeze Bottle)	Set	5
18	សម្ភារៈផ្ទះបាយ (ជ្រុង ថាស កាំបិត ស្លាបព្រា សម ចាន កម្រិតរំកិល កន្ត្រែង ចង្កៀម ដក ដកដា ដង្ហើប កន្ត្រែង) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនវាស់រាងកាយ (texture analyzer)	Unit	1
2	កម្រិតរំកិល (Siever shaker)	Unit	1
3	រិប្រូកតូម៉ែត្រ (Refractometers)	Unit	2
4	អ៊ីដ្រូម៉ែត្រ (ឌីជីថល) (digital hydrometer)	Unit	1
5	ម៉ាស៊ីនវាស់ចរិតមាណូម៉ែត្រ (salt meter)	Unit	1
6	ម៉ាស៊ីនវាស់ពណ៌ (Colorimeter)	Unit	1
7	ម៉ាស៊ីនរន្ធក្រា (Spectrophotometer)	Unit	1
8	ម៉ាស៊ីនក្រឡុក (Blender)	Unit	2
9	pHម៉ែត្រ (pH meter)	Unit	2
10	ម៉ាស៊ីនវាស់ភាពខាប់ (viscosity)	Unit	1
11	ជញ្ជីងវិភាគ (analytical balance)	Unit	1

12	ទូរទឹកកក (refrigerator)	Unit	1
13	ទូរកំប្លោក (freezer)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	pHស្តង់ដារ (pH Standard solution)	Set	2
2	ធានអាឡូយ៉ូម (aluminum bowl)	Piece	10
3	ក្រដាសធ្វើទម្ងន់ (weighing paper)	Box	1
4	ក្រដាសត្រោះ (filter paper)	Box	1
5	ក្រដាសpH (pH test strips)	Box	1
6	Pairឥត (Cuvette)	Box	1
7	ធានអាឡូយ៉ូម (aluminum bowl)	Piece	1
8	អាវបង្ការស្រពិសា (lab coat)	Set	20
9	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
10	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
11	ស្បែកដៃសុវត្ថិភាព (Safety gloves)	Pair	20
12	កញ្ចប់ការពារភ្នែក (Safety goggles)	Pair	20
13	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
14	ស្បែកដៃកំដៅ (Thermal gloves)	Pair	20
15	ស្បែកដៃ (vinyl gloves or PE gloves)	Box	1
16	ម៉ាសក្រមុំ (Face mask)	Box	1
17	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
18	ស្បែកដៃការពារ (Protective sleeve)	Pair	20
19	សម្ភារសម្រាប់ស្អាត (កូនក្រែប សំបោរ ប្រដាប់ជូតកំពល ថ្មីលាងចាន ត្រាស់ដុសបែក សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO4. Evaluate sensory properties/ characteristics of food products / ingredients

Assessment Criteria:

1. Appropriate personal protective equipment (PPE) is donned in accordance with safety and hygiene requirements
2. Sensory evaluation test(s) is / are set up in accordance with standard operating procedures (SOP)
3. Products is / are evaluated according to the following criteria for organoleptic testing:
 - Appearance
 - Taste
 - Texture
 - Aroma
4. Observations are correctly recorded using the appropriate descriptions
5. Test results are tabulated and interpreted correctly
6. Proper housekeeping is carried out

Related Knowledge, Skills, Attitude and Safety:**1. Knowledge includes the following:**

- 1.1 Explain the different aspects and criteria for organoleptic testing:
- 1.2 Appearance
- 1.3 Taste
- 1.4 Texture
- 1.5 Aroma
- 1.6 Describe the different types of organoleptic tests
- 1.7 Describe the common terms used to describe the sensory characteristics of food products
- 1.8 Explain the importance of organoleptic test
- 1.9 Explain the difference between objective and subjective sensory evaluation

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Use suitable sensory evaluation methods to generate data which will provide useful insights into consumers' preference, product acceptability and quality of food products, etc.

- 3.2 Interpret the relevant requirements stipulated in regulations / standards / guidelines /specifications when concluding the outcomes of checks on product quality and food labels

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 4

A. Tools

No.	Description	Unit	Quantity
1	ឆ្នាំង (Pot)	Set	2
2	ខ្លុះ (Pan)	Set	2
3	ចម្រ្កានប្លាស (មានធុង) (Gas Cooker with Gas tank)	Set	2
4	កែវបេស៊ែរ (Beaker)	Set	5
5	ស៊ីឡាំងក្រិត (graduate cylinder)	Set	5
6	ទែម៉ូម៉ែត្រ(អាល់កុល)(Alcohol cylinder)	Piece	10
7	ទែម៉ូម៉ែត្រ(វាស់សាច់) (meat thermometer)	Piece	5
8	សម្ភារៈផ្ទះបាយ (ជ្រៀម ថាស កាំបិត ស្លាបព្រា សម ចាន កាំបិត ក្រន្ត ចង្កៀម ម៉ក ម៉កនា ដង្កៀប កាំបិត) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនដុតត្រី (ខ្នាតតូច) (Small Oven)	Unit	1
2	ចម្រ្កានកម្ដៅ (microwave oven)	Unit	1
3	ម៉ាស៊ីនក្រុកឡុក (blender/homogenizer)	Unit	2
4	ទូរទឹកកក (Freezer)	Unit	1
5	ទូរដំណើការធ្វើតេស្តរដោយញាណ (Sensory test booth)	Unit	20

C. Materials

No.	Description	Unit	Quantity
1	ចានដី (Plastic plate)	Box	1
2	កែវដី (plastic cup)	Box	1
3	ស្លាបព្រាដី (plastic spoon)	Box	1

4	ធានអាណូយមីញ៉ូម (aluminum bowl)	Piece	1
5	អាវចុងដេកា (Apron)	Piece	20
6	ស្បែកដើមសុវត្ថិភាព (Safety shoes)	Pair	20
7	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
8	តុលាមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
9	រឺនតាសុវត្ថិភាព (Safety goggles)	Pair	20
10	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
11	តុលាមដៃកម្រិតកំដៅ (Thermal gloves)	Pair	20
12	តុលាមដៃ (vinyl gloves or PE gloves)	Box	1
13	ម៉ាសកុម (Face mask)	Box	1
14	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
15	តុលាមដៃដីង (Protective sleeve)	Pair	20
16	សម្ភារសម្រាប់ស្អាត (កូនកំឡុង កំបោះ ប្រដាប់ជូតកំពាល ប៉ូងលាងចាន ត្រាស់ដុសកែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO5. Comply with food labelling requirements

Assessment Criteria:

1. Non-compliance(s) with labelling requirements stipulated in the food regulations and/or standards is / are identified.
2. Observed non-compliance(s) is /are recorded in a prescribed format
3. Appropriate recommendations to correct the identified non-compliances are proposed

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 2.1 Explain the labelling requirements stipulated in various legislative standards and guidelines
- 2.2 Explain non-conformity of labelling

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Explain the importance of labelling as stated in standard and law
- 3.2 Conclude the results of quality test comparing to the quality description in label

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 5

A. Tools

No.	Description	Unit	Quantity
1			
2			
3			
4			

B. Equipment

No.	Description	Unit	Quantity
1			

2			

C. Materials

No.	Description	Unit	Quantity
1			
2			
3			
4			
5			

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

MODULES OF INSTRUCTION (3)
CORE COMPETENCIES

Course title : FOOD PROCESSING AND ANALYSIS
Unit of Competency : PERFORM BASIC MICROBIOLOGICAL TASKS
Module Title : PERFORMING BASIC MICROBIOLOGICAL TASKS
Module Descriptor :

This module covers the outcomes required to carry out basic microbiological tasks using suitable methods and technique to assess the microbiological quality of raw material and food products. Those methods and technique include sampling procedure, media preparation, inoculation technique, result interpretation, etc. In addition, reference will be made to relevant legislative and regulatory standards to assess compliance with the set requirements.

Level of Certification: High Diploma

Nominal Duration :hrs

Learning Outcomes :

Upon completion of this module, the students/trainees should be able to:

- LO1. Perform basic microbiological techniques
- LO2. Conduct microscopic examination of specimens
- LO3. Conduct environmental monitoring
- LO4. Prepare solid and liquid media
- LO5. Prepare food samples for analysis
- LO6. Conduct microbial analysis of food samples
- LO7. Perform decontamination and disposal of biological waste and labware

LO1. Perform basic microbiological techniques

Assessment Criteria:

1. Appropriate personal protective equipment (PPE) is donned in accordance with safety requirements
2. Relevant tools and materials are labelled clearly and legibly with essential information
3. Technique is performed aseptically using appropriate tools
4. Technique is performed in accordance with standard operating procedures (SOP)
5. Observations are clearly documented in the record sheet of approved format
6. Housekeeping is carried out in accordance with SOP

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Describe the scientific classification system for living organisms
- 1.2 Describe the different types of morphology for microorganism and their characteristics
- 1.3 Explain the environmental factors that can affect the quality of food products
- 1.4 Explain what microbial toxins are and their impact on food materials
- 1.5 Explain the factors affecting the growth of microorganisms in food
- 1.6 Describe the hazards that may arise due to breaching good hygiene practices
- 1.7 Describe the use of different laboratory equipment and apparatus used in a microbiology laboratory

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

Use different method to identify microbial in raw materials, food ingredients and products

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 1

A. Tools

No.	Description	Unit	Quantity
1	កែវប៊េត្រី (Petri dish)	Box	1
2	កែវអាណ (Erlenmeyer)	Set	5
3	កែវបេស៊ែរ (Beaker)	Set	5
4	បំពង់សាក (Test tube)	Box	1
5	បំពង់សាកមានគំរូប (Test tube with cap)	Box	1
6	ដើងទ្រុបបំពង់សាក (Test tube holder)	Piece	10
7	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
8	បាឡុងក្រិត (Volumetric flask)	Set	5
9	ពីប៉ែត (កែវ 5មីលីលីត្រ) (Glass Pipette 5ml)	Box	1
10	ពីប៉ែត (កែវ 10មីលីលីត្រ) (Glass Pipette 10ml)	Box	1
11	ពីប៉ែត (កែវ 25មីលីលីត្រ) (Glass Pipette 25)	Box	1
12	ពីប៉ែត (កែវ 50មីលីលីត្រ) (Glass Pipette 50)	Box	1
13	ឧបករណ៍បូមរុបពីប៉ែត (pipette Pumper)	Set	5
14	មីក្រូពីប៉ែត (Micropipette 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	5
15	មីក្រូពីប៉ែតធីប (Micropipette tips 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	1
16	ដបដាក់សូលុយស្យុង (Glass Bottle)	Set	5
17	ដីឡាវ (កែវ) (Glass Funnel)	Set	5
18	ឧបករណ៍ត្រោះ (Funnel)	Set	5
19	ឧបករណ៍ត្រោះសូលុយស្យុងរុប្រឹសំពាធ (Filtration unit with pump)	Set	2
20	ខ្នុរម៉ាញ៉េទិច (Magnetic Stir Bar)	Set	5
21	ដបទឹកចិត (Squeeze Bottle)	Piece	5
22	ស្នាមព្រាមន្ទីរពិសោធន៍ (lab Spatula)	Set	5
23	កាំចិត (Knife)	Piece	5
24	កក្រែង (Scissors)	Piece	5
25	ដង្កៀប (Tongs)	Piece	5
26	ទែម៉ូម៉ែត្រ(អាល់កុល)(Alcohol Thermometer)	Piece	5
27	Pair ផត (Cuvette)	Box	1
28	ចង្កៀងអាល់កុល(Alcohol burner)	Piece	5
29	អាវមន្ទីរពិសោធន៍ (lab Coat)	Set	20
30	ស្បែកជើងមន្ទីរពិសោធន៍ (Safety Shoes)	Pair	20
31	រ៉ែនតាសុវត្ថិភាព (Safety Goggles)	Set	20
32	ស្រោមដៃការពារកំដៅ (Thermal gloves)	Pair	20
33	ស្រោមដៃព័ង (Protective sleeve)	Pair	20

B. Equipment

No.	Description	Unit	Quantity
1	ទូទឹកកក (Refrigerator)	Unit	1
2	ទូបង្កក (freezer)	Unit	1
3	ទូរក្លាស (Chiller)	Unit	1
4	ជញ្ជីងវិភាគ (Analytical balance)	Unit	2
5	ម៉ាស៊ីនវ័រតិច (Vortex)	Unit	5
6	ឧបករណ៍បិទទឹក (Distilled Water Machine)	Set	1
7	ឧបករណ៍កំដៅ/ក្លរម៉ាញ៉េទិក (Magnetic heater/stirrer)	Unit	5
8	ម៉ាស៊ីនកម្ដៅទឹក (Water bath)	Unit	1
9	ម៉ាស៊ីនកម្ដៅទឹកមានរំញ័រ (Shaking water bath)	Unit	1
10	ឡសម្ងួត (Dry oven)	Unit	1
11	ម៉ាស៊ីនរំញ័រដោយសំលេង (Sonicator with controlled temperature)	Unit	1
12	ម៉ាស៊ីនក្រឡុក (blender/homogenizer)	Unit	2
13	ម៉ាស៊ីនបង្វិលចាកផ្ចិត (Centrifuge)	Unit	1
14	ម៉ាស៊ីនអូតូក្លាវ (Autoclave)	Unit	2
15	ម៉ាស៊ីនធ្វើអាយស្ទើសាច់ (Stomacher)	Unit	1
16	ឧបករណ៍កំណត់សីតុណ្ហភាពបណ្តុះមេរោគ (Incubator)	Unit	2
17	ឧបករណ៍កំណត់សីតុណ្ហភាពនិងក្រឡុកបណ្តុះមេរោគ (Shaking incubator)	Unit	2
18	ឧបករណ៍មីក្រូស្កុប (Microscopic)	Unit	5
19	ម៉ាស៊ីនស្ថិតត្រូ (Spectrophotometer)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	ក្រដាសប្រៃ (vinyl gloves or PE gloves)	Box	1
2	ម៉ាសមុខ (Face mask)	Box	1
3	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
4	សម្ភារសម្រាប់ស្អាត (ក្រដាសច្រូត កូនកន្សែង អំបោះ ប្រដាប់ច្រូតកំរាល ប៉ុងលាងចាន ប្រាស់ដុសកែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10
5	សារធាតុគីមី (Chemical Substance)	Set	1
	ក្រដាសប្រោះ (Filer Paper)	Box	1
6	ក្រដាសធ្វើជាតុគីមី (Weighing Paper)	Box	1
7	ចានធ្វើជាតុគីមី (Weighing Bowl)	Box	1
8	ក្រដាសpH (pH test strips)	Box	1
9	ថ្នាំបណ្តុះ	Box	5

10	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO2. Conduct microscopic examination of specimens

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Samples/specimens are prepared for examination in accordance with SOP
3. Sample/specimens are clearly labelled and identified with key information
4. Correct identification method/technique is selected and performed on isolated colonies obtained from pure culture
5. Equipment used for microscopic examination is properly set up and operated in accordance with SOP
6. Observations are correctly and clearly documented in the record sheet of approved format
7. Housekeeping is carried out in accordance with SOP

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.8 1.11.3 Describe safety precaution when analysis using microscope

Describe different method and procedures to define microbial using microscope

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Practice on microscope application
- 3.2
- 3.3

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 2

A. Tools

No.	Description	Unit	Quantity
1	ប៊ែរដ្រី (Petri dish)	Box	1

2	កែវគោណ (Erlenmeyer)	Set	5
3	កែវបេស៊ែរ (Beaker)	Set	5
4	បំពង់សាក (Test tube)	Box	1
	បំពង់សាកមានគំរូ (Test tube with cap)	Box	1
5	ដើងទ្រូបំពង់សាក (Test tube holder)	Piece	10
6	មីក្រូពីប៉ែត (Micropipette 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	5
7	មីក្រូពីប៉ែតដីប (Micropipette tips 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	1
8	ឧបករណ៍ត្រោះ (Funnel)	Set	5
9	ឧបករណ៍ត្រោះសូលុយស្យុងប្រើសំពាធ (Filtration unit with pump)	Set	2
10	ខ្លួនម៉ាញ៉េទិច (Magnetic Stir Bar)	Set	5
11	ដបទឹកបិត (Squeeze Bottle)	Piece	5
12	ស្នាបព្រាមឌីស្កាត (Lab Spatula)	Set	5
13	បន្ទះរាប់មេរោគ (Hemocytometer)	Set	5
14	ធុងដុតអាល់កុល (Alcohol Burner)	Piece	5
15	អាវមន្ទីរពិសោធន៍ (Lab Coat)	Set	20
16	ស្បែកដើមមន្ទីរពិសោធន៍ (safety shoes)	Pair	20
17	រ៉ែនតាសុវត្ថិភាព (safety goggles)	Set	20
18	ស្រោមដៃការពារកំដៅ (Thermal gloves)	Pair	20
19	ស្រោមដៃដីង (Protective sleeve)	Pair	20
20	កែវប៉េត្រី (Petri dish)	Box	1

B. Equipment

No.	Description	Unit	Quantity
1	ទូទឹកកក (refrigerator)	Unit	1
2	ទូបង្កុក (Freezer)	Unit	1
3	ទូរក្លាស (Chiller)	Unit	1
4	ជញ្ជីងវិភាគ (analytical balance)	Unit	2
5	ម៉ាស៊ីនវ័ញ់ (Vortex)	Unit	5
6	ឧបករណ៍បិទទឹក (Distilled water machine)	Set	1
7	ឧបករណ៍កំដៅ/ក្លរម៉ាញ៉េទិច (Magnetic heater/stirrer)	Unit	5
8	ទ្រូសម្ងាត់ (Dry oven)	Unit	1
9	ម៉ាស៊ីនវ័ញ់ដោយសីលេង (Sonicator with controlled temperature)	Unit	1
10	ម៉ាស៊ីនប្រកួត (blender/homogenizer)	Unit	2
11	ម៉ាស៊ីនអូតូក្លាវ (Autoclave)	Unit	2
12	ម៉ាស៊ីនធ្វើអាយស្ទីសាច់ (Stomacher)	Unit	1

13	ឧបករណ៍កំណត់សីតុណ្ហភាពបណ្តុះមេរោគ (Incubator)	Unit	2
14	ឧបករណ៍កំណត់សីតុណ្ហភាពនិងក្រឡុកបណ្តុះមេរោគ (Shaking incubator)	Unit	2
15	ឧបករណ៍មីក្រូស្កុប (Microscopic)	Unit	5

C. Materials

No.	Description	Unit	Quantity
1	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
2	ម៉ាស៊ីន (Face mask)	Box	1
3	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
4	សម្ភារសម្អាតទូទៅ (ក្រដាសជូត កូនកន្សែង អំបោះ ប្រដាប់ជូតកំពល ប៉ុងលាងចាន ត្រាស់ដុសកែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10
5	សារធាតុគីមី (Chemical Substance)	Set	1
6	ក្រដាសព្រោះ (Filter Paper)	Box	1
7	ក្រដាសធ្វើធាតុគីមី (Weighing Paper)	Box	1
8	ធានធ្វើធាតុគីមី (Weighing Bowl)	Box	1

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO3. Conduct environmental monitoring

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Sample(s)/test materials(s) is/are clearly labelled and identified with key information
3. Suitable identification method of monitoring is identified and performed in accordance with SOP
4. Sampling steps at specific test areas are carried out in accordance with established protocols
5. Samples are aseptically transferred to media according to suitable method using appropriate tools and techniques
6. Media are incubated at the correct conditions as specified in SOP
7. Test results are accurately recorded and correctly interpreted
8. Housekeeping is carried out in accordance with SOP

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the significance of aseptic technique in the microbiological laboratory
- 1.2 Describe the procedures for carrying out different types of air monitoring method
- 1.3 List the safety precautions that need to be undertaken during sterilization of labware

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Apply skills and techniques that are essential to achieve the cleanness in working environment

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 3

A. Tools

No.	Description	Unit	Quantity
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1	កែវប៉េត្រី (Petri dish)	Box	1
2	កែវកោណ (Erlenmeyer)	Set	5
3	កែវបេស៊ែរ (Beaker)	Set	5
5	បំពង់សាក (Test tube)	Box	1
6	បំពង់សាកមានគំរូ (Test tube with cap)	Box	1
7	ដើងទ្រូបំពង់សាក (Test tube holder)	Piece	10
8	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
9	បារូម៉ាត្រិក (Volumetric flask)	Set	5
10	ពីប៉េត (កែវ 5មីលីលីត្រ) (Glass Pipette 5ml)	Box	1
11	ពីប៉េត (កែវ 10មីលីលីត្រ) (Glass Pipette 10ml)	Box	1
12	ពីប៉េត (កែវ 25មីលីលីត្រ) (Glass Pipette 25)	Box	1
13	ពីប៉េត (កែវ 50មីលីលីត្រ) (Glass Pipette 50)	Box	1
14	ឧបករណ៍បូមប្រើជាមួយពីប៉េត (Pipette Pumper)	Set	5
15	មីក្រូពីប៉េត (Micropipette 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	5
16	មីក្រូពីប៉េតដីប (Micropipette tips 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	1
17	ដបដាក់សូលុយស្យុង (Glass Bottle)	Set	5
18	ដីឡូរ (កែវ)(Glass Funnel)	Set	5
19	ឧបករណ៍ប្រោះ (Funnel)	Set	5
20	ឧបករណ៍ប្រោះសូលុយស្យុងប្រើសំពាធ (Filtration unit with pump)	Set	2
21	ខ្លួនប៉ាញ៉េទិច(Magnetic stir bar)	Set	5
22	ដបទឹកបិត (Squeeze Bottle)	Piece	5
23	ស្លាបប្រាមម្នីរពិសោធន៍ (Lab Spatula)	Set	5
24	កាំចិត (Knife)	Piece	5
25	កង្កែប (Scissors)	Piece	5
26	ដង្ហៀប (Tongs)	Piece	5
27	ទែម៉ូម៉ែត្រ(អាល់កុល) (Alcohol Thermometer)	Piece	5
28	Pair ផត (Cuvette)	Box	1
29	ចង្ហៀងអាល់កុល (Alcohol burner)	Piece	5
30	អាវម្នីរពិសោធន៍ (lab coat)	Set	20
31	ស្បែកដើមម្នីរពិសោធន៍ (Safety Shoes)	Pair	20
32	ដំនាសុវត្ថិភាព (Safety goggles)	Set	20
33	ប្រឡាមដៃការពារកំដៅ (Thermal gloves)	Pair	20

B. Equipment

No.	Description	Unit	Quantity
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1	ទូទឹកកក (refrigerator)	Unit	1
2	ទូបង្កក (freezer)	Unit	1
3	ទូរក្លាសេ (chiller)	Unit	1
4	ជញ្ជីងវិភាគ (analytical balance)	Unit	2
5	ម៉ាស៊ីនវ័រតិច (Vortex)	Unit	5
6	ឧបករណ៍បិទទឹក (Distilled Water Machine)	Set	1
7	ម៉ាស៊ីនអូតូក្លាវ (Autoclave)	Unit	2
8	ឧបករណ៍កំណត់សីតុណ្ហភាពបណ្តុះមេរោគ (Incubator)	Unit	2
9	ឧបករណ៍កំណត់សីតុណ្ហភាពនិងក្រឡុកបណ្តុះមេរោគ (Shaking incubator)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
2	ម៉ាសមុខ (Face mask)	Box	1
3	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
4	សម្ភារសម្អាតទូទៅ (ក្រដាសជូត កូនកន្សែង អំបោះ ប្រដាប់ជូតកំពាល ប៉ុងលាងទាន ត្រាស់ដុសកែវ សាប៊ូលាងទាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10
5	សារធាតុគីមី (Chemical Substance)	Set	1
6	ក្រដាសច្រោះ (Filter paper)	Box	1
7	ក្រដាសថ្លឹងធាតុគីមី (Weighing paper)	Box	1
8	ធានថ្លឹងធាតុគីមី (Weighing bowl)	Box	1
9	ថ្នាលបណ្តុះ	Box	5

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation

3. Interview Test
4. Written Test

LO4. Prepare solid and liquid media

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Media is prepared in accordance with SOP
3. Sterilization of media is performed under the correct conditions and in accordance with SOP
4. Sterilized media is appropriately handled and stored at appropriate conditions as specified in standard procedures

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Identify different types of media used in microbiological analysis:
 - Basal media
 - Enriched media
 - Selective media
 - Indicator media
 - Transport and storage media
- 1.2 Explain the steps to prepare and store solid or liquid media
- 1.3 Explain the principle of sterilization
- 1.4 Describe the operational procedure for sterilization of media
- 1.5 Prepare and handle the sterilized media in appropriated storage condition

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Apply the principles of preparing, sterilizing, and keeping the media
- 3.2
- 3.3

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 4

A. Tools

No.	Description	Unit	Quantity
1	កែវប៊េត្រី (Petri dish)	Box	1
2	កែវអេលម័រ (Elenmyer)	Set	5
3	កែវបេស៊ែរ (Beaker)	Set	5
4	បំពង់សាក (Test tube)	Box	1
5	បំពង់សាកមានគំរូប (Test tube with cap)	Box	1
6	ដើងទ្រុបំពង់សាក (Test tube holder)	Piece	10
7	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
8	បាឡុងក្រិត (Volumetric flask)	Set	5
9	ពីប៉ែត (កែវ 5មីលីលីត្រ) (Glass Pipette 5ml)	Box	1
10	ពីប៉ែត (កែវ 10មីលីលីត្រ) (Glass Pipette 10ml)	Box	1
11	ពីប៉ែត (កែវ 25មីលីលីត្រ) (Glass Pipette 25)	Box	1
12	ពីប៉ែត (កែវ 50មីលីលីត្រ) (Glass Pipette 50)	Box	1
13	ឧបករណ៍បូមប្រើជាមួយពីប៉ែត (pipette pumper)	Set	5
14	មីក្រូពីប៉ែត (Micropipette 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	5
15	មីក្រូពីប៉ែតគីប (Micropipette tips 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	1
16	ដបដាក់សូលុយស្យុង (Glass Bottle)	Set	5
17	ដីឡាន (កែវ) (Glass funnel)	Set	5
18	ឧបករណ៍ត្រោះ (Funnel)	Set	5
19	ឧបករណ៍ត្រោះសូលុយស្យុងប្រើសំពាធច (Filtration unit with pump)	Set	2
20	ខ្នុរម៉ាញ៉េទិច (magnetic stir bar)	Set	5
21	ដបទឹកចិត (Squeeze bottle)	Piece	5
22	ស្នាបព្រាមន្ទីរពិសោធន៍ (lab spatula)	Set	5
23	កាំបិត (knife)	Piece	5
24	កង្កែប (scissors)	Piece	5
25	ដង្កៀប (Tongs)	Piece	5
26	ទែម៉ូម៉ែត្រ (អាល់កុល) (Alcohol thermometer)	Piece	5
27	ចង្កៀងអាល់កុល (Alcohol burner)	Piece	5
28	អាវបង្ក្រាពិសោធន៍ (lab coat)	Set	20
29	ស្បែកដើមជើងពិសោធន៍ (safety shoes)	Pair	20
30	វ៉ែនតាសុវត្ថិភាព (safety goggles)	Set	20
31	ក្រណាមដៃការពារកំដៅ (Thermal gloves)	Pair	20
32	ក្រណាមដៃព័ង (Protective sleeve)	Pair	20

B. Equipment

No.	Description	Unit	Quantity
1	ទូទឹកកក (Refrigerator)	Unit	1
2	ទូបង្កក (freezer)	Unit	1
3	ទូរក្តាស (chiller)	Unit	1
4	ធាតុវិភាគ (analytical balance)	Unit	2
5	ម៉ាស៊ីនវិល (Vortex)	Unit	5
6	ឧបករណ៍បិទទឹក (Distilled water machine)	Set	1
7	ឧបករណ៍កំដៅ/ក្រូម៉ាញេទិក (Magnetic heater/stirrer)	Unit	5
8	ម៉ាស៊ីនកម្ដៅទឹក (Water bath)	Unit	1
9	ម៉ាស៊ីនកម្ដៅទឹកមានរំញ័រ (Shaking water bath)	Unit	1
10	ឡស្ងួត (Dry oven)	Unit	1
11	ម៉ាស៊ីនរំញ័រដោយសំលេង (Sonicator with controlled temperature)	Unit	1
12	ម៉ាស៊ីនអូតូក្លាវ (Autoclave)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
2	ម៉ាសមុខ (Face mask)	Box	1
3	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
4	សម្ភារសម្អាតទូទៅ (ក្រដាសជូត កូនកន្សែង អំបោះ ប្រដាប់ជូតកំហល ប៉ុងលាងចាន ត្រាស់ដុសកែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10
5	សារធាតុគីមី (Chemical substance)	Set	1
6	ក្រដាសច្រោះ (filter paper)	Box	1
7	ក្រដាសធ្វើធាតុគីមី (weighing paper)	Box	1
8	ចានធ្វើធាតុគីមី (weighing bowl)	Box	1
9	ក្រដាសpH (pH test strips)	Box	1
10	ថ្នាំលបណ្តុះ	Box	5

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2

7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO5. Prepare food samples for analysis

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Sampling is carried out aseptically and in accordance with sampling plan / SOP
3. Sample information is accurately and legibly recorded
4. Sample is appropriately handled and held under the correct conditions prior to analysis
5. Homogenization of samples is carried out in accordance with SOP

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the use of different types of sampling plan and tools
- 1.2 List important information that needs to be documented for identification of samples / specimen
- 1.3 Describe the procedures and precautions that need to be taken when collecting samples for analysis
- 1.4 Explain the steps required and precautions needed to prepare samples/specimens for testing

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Carry out sampling plan and preparing sample correctly according to each type of sample prior to analysis
- 3.2
- 3.3

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 5

A. Tools

No.	Description	Unit	Quantity
1	ឃីវប៊ែត្រី (Petri dish)	Box	1
2	ឃីវអេណូ (Elenmyer)	Set	5

3	កែវបេសែរ (Beaker)	Set	5
4	បំពង់សាក (Test tube)	Box	1
5	បំពង់សាកមានគំរូប (Test tube with cap)	Box	1
6	ដើងទ្រូបំពង់សាក (Test tube holder)	Piece	10
7	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
8	បាឡូម៉ែត្រ (Volumetric flask)	Set	5
9	ពីប៉េត (កែវ 5មីលីលីត្រ) (Glass Pipette 5ml)	Box	1
10	ពីប៉េត (កែវ 10មីលីលីត្រ) (Glass Pipette 10ml)	Box	1
11	ពីប៉េត (កែវ 25មីលីលីត្រ) (Glass Pipette 25)	Box	1
12	ពីប៉េត (កែវ 50មីលីលីត្រ) (Glass Pipette 50)	Box	1
13	ឧបករណ៍បូមប្រើជាមួយពីប៉េត (pipette pumper)	Set	5
14	មីក្រូពីប៉េត (Micropipette 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	5
15	មីក្រូពីប៉េតធីប (Micropipette tips 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	1
16	ដបដាក់សូលុយស្យុង (Glass Bottle)	Set	5
17	ដីឡាវ (កែវ) (Glass funnel)	Set	5
18	ឧបករណ៍រុច្ឆោះ (Funnel)	Set	5
19	ឧបករណ៍រុច្ឆោះសូលុយស្យុងប្រើសំពាធ (Filtration unit with pump)	Set	2
20	ខ្នុរម៉ាញ៉េទិច (Magnetic stir bar)	Set	5
21	ដបទឹកមិត (squeeze bottle)	Piece	5
22	ស្នាមព្រាមឌីរេសោធន៍ (lab spatula)	Set	5
23	កាំបិត (knife)	Piece	5
24	កន្ត្រៃ (scissors)	Piece	5
25	ដង្ហៀប (tongs)	Piece	5
26	ទែម៉ូម៉ែត្រ (អាល់កុល)(alcohol thermometer)	Piece	5
27	Pair ផត (Cuvette)	Box	1
28	ចង្ហៀងអាល់កុល (alcohol burner)	Piece	5
29	អាវបង្ក្រាវពិសោធន៍ (lab coat)	Set	20
30	ស្បែកដើមបង្ក្រាវពិសោធន៍ (safety shoes)	Pair	20
31	រ៉ែនតាសុវត្ថិភាព (safet goggles)	Set	20
32	ក្រណាមដៃកម្រិតកំដៅ (Thermal gloves)	Pair	20
33	ក្រណាមដៃព័ង (Protective sleeve)	Pair	20

B. Equipment

No.	Description	Unit	Quantity
1	ទូទឹកកក (Refrigerator)	Unit	1

2	ទូបង្កក (Freezer)	Unit	1
3	ទូរក្លាស (chiller)	Unit	1
4	ជញ្ជីងវិភាគ (Analytical balance)	Unit	2
5	ម៉ាស៊ីនវ័ញ្ច (Vortex)	Unit	5
6	ឧបករណ៍ចិញ្ចឹមទឹក (Distilled Water machine)	Set	1
7	ឧបករណ៍កំដៅ/ក្រូម៉ាញេទិក (Magnetic heater/stirrer)	Unit	5
8	ម៉ាស៊ីនកម្ដៅទឹក (Water bath)	Unit	1
9	ម៉ាស៊ីនកម្ដៅទឹកមានរំញ័រ (Shaking water bath)	Unit	1
10	ទ្រុសប្លុក (Dry oven)	Unit	1
11	ម៉ាស៊ីនរំញ័រដោយសំលេង (Sonicator with controlled temperature)	Unit	1
12	ម៉ាស៊ីនក្រូមុក (blender/homogenizer)	Unit	2
13	ម៉ាស៊ីនបង្វិលចាកផ្ចិត (Centrifuge)	Unit	1
14	ម៉ាស៊ីនអូតូក្លាវ (Autoclave)	Unit	2
15	ម៉ាស៊ីនធ្វើអាយស្ទើសាច់ (Stomacher)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
2	ម៉ាសមុខ (Face mask)	Box	1
3	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
4	សម្ភារសម្អាតទូទៅ (ក្រដាសជូត កូនកន្សែង អំបោះ ប្រដាប់ជូតកំពាល ប៉ុងលាងចាន ត្រាស់ដុសកែវ សាប៊ូលាងចាន)	Set	10
5	សារធាតុគីមី (Chemical substance)	Set	1
6	ក្រដាសប្រោះ (filter paper)	Box	1
7	ក្រដាសធ្លឹងធាតុគីមី (weighing paper)	Box	1
8	ចានធ្លឹងធាតុគីមី (weighing bowl)	Box	1
9	ក្រដាសpH (pH test strips)	Box	1
10	ថ្នាំបណ្តុះ	Box	5

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2

10	Whiteboard Eraser	unit	1
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Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO6. Conduct microbial analysis of food samples

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Appropriate tools/labware and samples are clearly labelled and identified with essential information
3. Sample dilution is prepared accordance with SOP
4. Appropriate test method is selected and performed in accordance with SOP
5. Media are incubated at the correct conditions as specified in standard procedures
6. Test results are accurately recorded and correctly interpreted
7. Housekeeping is carried out in accordance with SOP

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Describe the procedure for serial dilution
- 1.2 Describe the different identification methods and proper procedures to identify microorganisms
- 1.3 Explain the procedure of rapid diagnostic test methods for different types of microbial test in the food industry
- 1.4 Describe the steps to prepare samples for pour plate and spread plate method
- 1.5 Explain the procedures of performing different types of swab test
- 1.6 Explain the methods for different types of microbial test:
 - Total plate count
 - Total yeast and mould
 - Gram stain
 - Coliform and E. coli
 - Staphylococcus
 - Salmonella
 - Clostridium
- 1.7 Explain the significance of microbial counting
- 1.8 Explain how test results are calculated and interpreted
- 1.9 List the steps required to interpret microbial results

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Relate identified microorganism to product shelf-life stability, quality and safety
- 3.2 Apply principles relating to occupational safety and health (OSH) when performing laboratory tasks / activities

- 3.3 Carry out laboratory works that are in line with GLP to generate reliable and high-quality test data
- 3.4 Interpret the relevant requirements stipulated in regulations / standards / guidelines / specifications when concluding the outcomes of checks on product quality and food labels

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 6

A. Tools

No.	Description	Unit	Quantity
1	កែវប៉េត្រី (Petri dish)	Box	1
2	កែវអាណា (Elenmyer)	Set	5
3	កែវបេស៊ែរ (Beaker)	Set	5
4	បំពង់សាក (Test tube)	Box	1
5	បំពង់សាកមានគំរូប (Test tube with cap)	Box	1
6	ដើងទ្រូបំពង់សាក (Test tube holder)	Piece	10
7	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
8	បាឡុងក្រិត (Volumetric flask)	Set	5
9	ពីប៉ែត (កែវ 5មីលីលីត្រ) (Glass Pipette 5ml)	Box	1
10	ពីប៉ែត (កែវ 10មីលីលីត្រ) (Glass Pipette 10ml)	Box	1
11	ពីប៉ែត (កែវ 25មីលីលីត្រ) (Glass Pipette 25)	Box	1
12	ពីប៉ែត (កែវ 50មីលីលីត្រ) (Glass Pipette 50)	Box	1
13	ឧបករណ៍បូមរុបពីប៉ែត (pipette pumper)	Set	5
14	មីក្រូពីប៉ែត (Micropipette 100 μL, 200 μL, 1000 μL, 5000 μL)	Set	5
15	មីក្រូពីប៉ែតធីប (Micropipette tips 100 μL, 200 μL, 1000 μL, 5000 μL)	Set	1
16	ដបដាក់សូលុយស្យុង (Glass Bottle)	Set	5
17	ដីឡាន (កែវ) (Glass funnel)	Set	5
18	ឧបករណ៍ត្រោះ (Funnel)	Set	5
19	ឧបករណ៍ត្រោះសូលុយស្យុងរុបដោយប្រើសំពត់ (Filtration unit with pump)	Set	2
20	ខ្នុរម៉ាញ៉េទិច (Magnetic stir bar)	Set	5
21	ដបទឹកចិត (squeeze bottle)	Piece	5
22	ស្នាបព្រាមន្ទីរពិសោធន៍ (lab spatula)	Set	5

23	កាំបិត (knife)	Piece	5
24	កង្កែប (scissors)	Piece	5
25	ដង្ហៀប (tongs)	Piece	5
26	រ៉ែទម៉ូម៉ែត្រ(អាល់កុល)(alcohol thermometer)	Piece	5
27	Pair ធាត (Cuvette)	Box	1
28	ចង្កៀងអាល់កុល (alcohol burner)	Piece	5
29	អាវមន្ទីរពិសោធន៍ (lab coat)	Set	20
30	ស្បែកជើងមន្ទីរពិសោធន៍ (safety shoes)	Pair	20
31	ដំនតាសុវត្ថិភាព (safety goggles)	Set	20
32	ប្រសាមនៃការការពារកំដៅ (Thermal gloves)	Pair	20
33	ប្រសាមនៃការការពារ (Protective sleeve)	Pair	20

B. Equipment

No.	Description	Unit	Quantity
1	ទូទឹកកក (Refrigerator)	Unit	1
2	ទូបង្កក (Freezer)	Unit	1
3	ទូរក្តាស (chiller)	Unit	1
4	ជញ្ជីងវិភាគ (Analytical balance)	Unit	2
5	ម៉ាស៊ីនវ័ញ់ (Vortex)	Unit	5
6	ឧបករណ៍បិទទឹក (Distilled Water machine)	Set	1
7	ឧបករណ៍កំដៅ/កូរម៉ាញ៉េទិក (Magnetic heater/stirrer)	Unit	5
8	ម៉ាស៊ីនកម្ដៅទឹក (Water bath)	Unit	1
9	ម៉ាស៊ីនកម្ដៅទឹកមានរំញុំរ (Shaking water bath)	Unit	1
10	ឡស្ងួត (Dry oven)	Unit	1
11	ម៉ាស៊ីនរំញុំរដោយសីល្បង (Sonicator with controlled temperature)	Unit	1
12	ម៉ាស៊ីនក្រឡុក (blender/homogenizer)	Unit	2
13	ម៉ាស៊ីនបង្វិលចាកផ្ចិត (Centrifuge)	Unit	1
14	ម៉ាស៊ីនអូតូក្លាវ (Autoclave)	Unit	2
15	ម៉ាស៊ីនធ្វើដោយស្មើសាច់ (Stomacher)	Unit	1
16	ឧបករណ៍កំដៅសីតុណ្ហភាពបណ្តុះមេរោគ (Incubator)	Unit	2
17	ឧបករណ៍កំដៅសីតុណ្ហភាពនិងក្រឡុកបណ្តុះមេរោគ (Shaking incubator)	Unit	2
18	ឧបករណ៍មីក្រូស្កុប	Unit	5
19	ម៉ាស៊ីនស្ថិត្រូ (Spectrophotometer)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
2	ម៉ាសមុខ (Face mask)	Box	1
3	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
4	សម្ភារសម្អាតទូទៅ (ក្រដាសជូត កូនកន្សែង អំបោះ ប្រដាប់ជូតកំរាល ប៉ុងលាងចាន ច្រាស់ដុសកែវ សាប៊ូលាងចាន)	Set	10
5	សារធាតុគីមី (Chemical substance)	Set	1
6	ក្រដាសប្រោះ (filter paper)	Box	1
7	ក្រដាសធ្វើទម្ងន់ (weighing paper)	Box	1
8	ចានធ្វើទម្ងន់ (weighing bowl)	Box	1
9	ក្រដាសpH (pH test strips)	Box	1
10	ថ្នាំលាបស្បែក	Box	5

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO7. Perform decontamination and disposal of biological waste and labware

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Labware required for sterilization is identified correctly
3. Labware is sterilized under the correct conditions and in accordance with SOP
4. Sterilized labware is handled appropriately to prevent contamination
5. Verification on the effectiveness of sterilization is performed in accordance with SOP
6. Test materials/reagents are disposed of safely and in compliance with regulatory requirements

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of regulatory requirements for waste disposal
- 1.2 Explain the measures for waste control and the proper procedure for waste disposal

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Manage laboratory wastes in accordance with established procedures to optimize safety and minimize environmental impact

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 7

A. Tools

No.	Description	Unit	Quantity
1	អាវមធុរ្តិសោធន៍ (lab coat)	Set	20
2	ស្បែកដើមមធុរ្តិសោធន៍ (safety shoes)	Pair	20
3	វីនតាសុវត្ថិភាព (safety goggles)	Set	20
4	ក្រណាមដៃកម្ដៅ (Thermal gloves)	Pair	20
5	ក្រណាមដៃព័ង (Protective sleeve)	Pair	20

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនអូតូក្លាវ (autoclave)	Unit	2
2			

C. Materials

No.	Description	Unit	Quantity
1	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
2	ម៉ាសមុខ (Face mask)	Box	1
3	សម្ភារសម្អាតទូទៅ (កូនកន្សែង អំបោះ ប្រដាប់ជូតកំរាល ប៉ុងលាងចាន ច្រាស់ដុសកែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10
4			

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

MODULES OF INSTRUCTION (4)
MAINTAIN FOOD SAFETY AND FOOD HYGIENE STANDARDS IN THE AGRI-FOOD
SUPPLY CHAIN
CORE COMPETENCIES

Course title	:	FOOD PROCESSING AND ANALYSIS
Unit of Competency	:	MAINTAIN FOOD SAFETY AND FOOD HYGIENE STANDARDS IN THE AGRI-FOOD SUPPLY CHAIN
Module Title	:	MAINTAINING FOOD SAFETY AND FOOD HYGIENE STANDARDS IN THE AGRI-FOOD SUPPLY CHAIN
Module Descriptor	:	

This module covers the outcomes required to support the effective implementation of prerequisite programmes and food safety management systems (e.g., Hazard Analysis and Critical Control Point-HACCP and ISO22000) within food establishments. This unit covers essential knowledge and skills on food safety assessment, food safety and quality parameters monitoring, inspection of food premises, implementation of corrective/preventive actions, documentation and record keeping, etc. Reference will be also be made to the relevant food safety standards to enhance understanding on the requirements to be followed / adhered to when implementing the programmes / systems for the production of safe and quality food products

Level of Certification: High Diploma

Nominal Duration : hrs

Learning Outcomes :

Upon completion of this module, the students/trainees should be able to:

- LO1. Conduct hazard analysis to identify potential food safety hazards
- LO2. Monitor food safety and quality parameters in food safety quality management systems
- LO3. Carry out food hygiene inspection at food premises
- LO4. Carry out corrective / preventive actions
- LO5. Carry out logging and documentation

LO1. Conduct hazard analysis to identify potential food safety hazards

Assessment Criteria:

1. Correct procedure is followed in accordance with requirement in the relevant food safety management system
2. Correct hazards are correctly identified and classified for incoming ingredients and raw materials
3. Correct hazards and critical control points (CCP) are correctly identified and classified for each process with reference to the relevant flowcharts
4. Correct measures to be applied to prevent / eliminate the hazard or reduce it to an acceptable level are recommended
5. Hazards identified are documented in the prescribed format

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Describe the different types of food safety management systems such as GMP, HACCP, ISO22000, etc
- 1.2 Describe the types of hazards associated with food safety in food premise
- 1.3
- 1.4 Explain the requirements stated in the various food safety management systems, including prerequisite programmes
- 1.5
- 1.6 Explain the importance of identifying hazards and their root causes
- 1.7 Good housekeeping practice

2. Attitude includes the following:

- 2.1 Patriotism
- 2.1 Safety consciousness
- 2.1 Responsibility
- 2.1 Industriousness
- 2.1 Obedience
- 2.1 Quality consciousness
- 2.1 Teamwork
- 2.1 Patience
- 2.1 Honest

3. Skill includes the following:

- 3.1 Conduct hazard assessment for identification of potential food safety hazards and critical control points (CCP)
- 3.2 Identify deviations and non-conformances

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO2. Monitor food safety and quality parameters in food safety quality management systems

Assessment Criteria:

1. Requirements outlined in the relevant food safety management system are followed
2. Appropriate requirements / critical limits for relevant safety and quality parameters are identified correctly
3. Product / process deviations are identified correctly
4. Measurements and observations required to monitor the safety and quality parameters are carried out correctly in accordance with established standard operating procedure
5. Measurements and observations are correctly recorded in the prescribed format.
6. Non-conformance/deviations/observations are reported to the relevant personnel

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of establishing preventive measures in order to minimize hazards in the food supply chain
- 1.2 Describe the sign of pest infestation and importance of pest control in the food industry
- 1.3 Explain the terms PRP, oPRP and CCPs implemented at various stages of food production, including purchasing, preparation and storage
- 1.4 Explain the use of critical limits for monitoring of product / process deviations impacting food safety
- 1.5 Explain the various measures that are used in the monitoring of CCPs, including visual observation, pH, temperature and moisture level
- 1.6 Explain how different types of methods are used in monitoring and verifying CCPs
- 1.7 Evaluate the various types of hazards identified

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Establish requirements / critical limits for relevant safety and quality parameters
- 3.1 Measure and observe the safety and quality parameters using suitable tools and methods

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 2

A. Tools

No.	Description	Unit	Quantity
1	Temperature logger (ឧបករណ៍តាមដានសីតុណ្ហភាពនិងសំណើម)	sets	10
2	Infrared thermometer (ទ្រទ្ងង់ម៉ែត្រ IR)	sets	5
3	Probe thermometer (ទ្រទ្ងង់ម៉ែត្រ)	sets	10
4	Thermocouple (ទ្រទ្ងង់ម៉ែត្រខ្សែអគ្គីសនី)	sets	5
5	Dial thermometer (ទ្រទ្ងង់ម៉ែត្រសម្រាប់វាស់សាច់)	sets	10
6	Thermohygrometer (ទ្រទ្ងង់ម៉ែត្រសម្រាប់វាស់សីតុណ្ហភាពនិងសំណើម)	sets	5
7	Stop watch (នាឡិកាផ្ទៀងម៉ោង)	sets	10
8	pH meter (hand-held) (pHម៉ែត្រចល័ត)	unit	4
9	pH meter (bench-top) (pHម៉ែត្រអចល័ត)	unit	1
10	Water activity meter(ឧបករណ៍វាស់ aw)	units	2
11	Refractometer (ឧបករណ៍វាស់កំហាប់)	sets	5
12	Laptop (កុំព្យូទ័រដៃ)	units	5
13	Blender (ម៉ាស៊ីនកិន)	units	5
14	Induction cooker (ចង្ក្រានអគ្គីសនី)	sets	10
15	Cooking pot (ភ្នាំង)	sets	10
16	Combinational oven (ម៉ាស៊ីនដុតនិងពហុមុខងារ)	units	2
17	Sheet pan (ថាសដុតនី)	sets	20
18	Sheet pan rack (ទូដាក់តម្រៀបថាស) https://www.amazon.sg/product-reviews/B00B1J0FV8/ref=pd_sbs_cr_sccl_2/358-9312088-0234619?pd_rd_w=hfUOU&pf_rd_p=f815a8e3-8cea-413d-9742-28df7ed57a60&pf_rd_r=HV6GBZ53DAV55DFB4KEE&pd_rd_r=13aca911-0d03-4377-84cd-2123f1244053&pd_rd_wg=zf6Rc&pd_rd_i=B00B1J0FV8	sets	2
19	Glass jar (with caps: approx.: 45-55ml) (កែវថ្មីមានត្រប)	sets	20
20	Weighing balance (up to 200g; readability 0.01g) (ជញ្ជីងថ្នឹង)	units	2
21	Weighing balance (up to 2kg; readability 0.01g) (ជញ្ជីងថ្នឹង)	units	2
22	Weighing balance (up to 1kg; readability 1g) (ជញ្ជីងថ្នឹង)	units	2
23	Weighing balance (up to 5kg; readability 1g) (ជញ្ជីងថ្នឹង)	units	2
24	Kitchen tools (cutting boards, spoons, knives, forks, mixing bowls, knives, strainers / colanders) សម្ភារៈផ្ទះបាយ (ជ្រួញ ថាស កាំបិត ស្លាបព្រា សម ចាន កាំបិត កន្ត្រៃ ចង្កឹះ ដក ដកតា ដង្កៀប កន្ត្រៃ)	sets	10

B. Equipment

No.	Description	Unit	Quantity
1	Freezer (ទូរង្គុក)	unit	1
2	Blast chiller / freezer (ទូរទឹកកក)		
3	Moisture analyzer (ម៉ាស៊ីនវាស់សំណើម)	units	2
4	Headspace analyzer (for food packaging) (ម៉ាស៊ីនវាស់កម្រិតឧស្ម័ន)	unit	1
5	Metal detector (ម៉ាស៊ីនវាស់សមាសធាតុលោហៈ)	unit	1
6	Chiller (ទូរត្រជាក់)	unit	1
7	Hot-holding cabinet (ទូរក្រយាមកម្ដៅ)	unit	1
8	Cold-holding cabinet (ទូរក្រយាមត្រជាក់)	unit	1

C. Materials

No.	Description	Unit	Quantity
1	Agricultural produce (e.g., fruits, vegetables, nuts, etc.) (កម្រិតផលិតផលកសិកម្ម ឧ. ផ្លែឈើ, បន្លែ, សណ្ដែកដី)	sets	10
2	Approved food grade chemical / ingredients (e.g. citric acid, salt, sugar, etc.) (សមាសធាតុគីមី និង , អំបិល, ស្ករ។ល។)	sets	10
3	Commercial products (e.g. canned food) for quality checks (កម្រិតពិនិត្យគុណភាពអាហារកែច្នៃ)	sets	10
4			
5			

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO3. Carry out food hygiene inspection at food premises

Assessment Criteria:

1. Scope of inspection is identified correctly
2. Suitable tools and methods are used to conduct inspection
3. Results of the inspection are correctly recorded in the prescribed format
4. Results of inspection are interpreted in accordance with established standards / regulations and requirements

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Describe the scope, procedure and methods used for food hygiene inspection
- 1.2 Explain the results of monitoring in responding to the standard, regulation and other requirement

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Demonstrate good personal hygiene practices
- 3.2 Perform hygiene inspection using suitable tools and methods

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 3

A. Tools

No.	Description	Unit	Quantity
1	Dry storage rack (with food items) (ទូរដាក់តម្រៀបថាសសម្រាប់សម្លុត)	set	1
2	Drying rack (for drying kitchen tools, crockery and utensils) (ទូរសម្រាប់សម្លុតឧបករណ៍ទូទៅ)		
3	Cleaning tools (brooms, mops, pails, cloth, scrubs, etc.) (ឧបករណ៍សម្អាត ដូចជា អំបោស, ក្រណាត់ជួត, ធុង, ក្រណាត់, ច្រាស)	set	5

4	Hot-holding cabinet (ទូរក្សាកម្ដៅ)	unit	1
5	Cold-holding cabinet (ទូរក្សាការព្រាត្រជាក់)	unit	1
6	Bain marie (ឆ្នាំងក្សាកម្ដៅម្លូប) https://www.superiorkitchenequipment.com/products/218?variant=38102685941939&currency=SGD&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&utm_campaign=gs-2021-01-03&utm_source=google&utm_medium=smart_campaign	units	2
7	Kitchen tools (cutting boards –assorted colours, spoons, knives, forks, mixing bowls, knives, strainers / colanders) សម្ភារៈផ្ទះបាយ (ជ្រៀត, ស្នាមប្រា, កាំបិត, សម, ប្រដាប់លាយ Unit កញ្ចប់ កន្លែង	sets	10

B. Equipment

No.	Description	Unit	Quantity
1	Chiller (ទូរក្ដៅស្ងួត)	unit	1
2	Freezer (ទូរក្ដៅត្រជាក់)	unit	1
	Blast freezer / chiller (ទូរក្ដៅត្រជាក់/ទូរក្ដៅស្ងួត)	unit	1
	Combinational oven (ម៉ាស៊ីនដុតចំណីហ្មុយខងារ)	units	2

C. Materials

No.	Description	Unit	Quantity
1	Inspection checklist / form (ទម្រង់ផ្ទៀងផ្ទាត់)	sets	20
2	NC form / records (ទម្រង់កត់ត្រា)	sets	20
3	Sample quality parameter monitoring forms (ទម្រង់ត្រួតពិនិត្យគុណភាពប៉ារ៉ាម៉ែត្រសំណាក)	sets	20
4	Food ingredients (Unitផ្សំអាហារ)	sets	20
5	Corrective / preventive action forms / records (ទម្រង់កែតម្រូវ/ទម្រង់សកម្មភាព/ទម្រង់កត់ត្រា)	sets	20
6	Videos (featuring non-conformances) វីដេអូ		

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2

8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO4. Carry out corrective / preventive actions

Assessment Criteria:

1. Non-conformances / deviations are identified and classified according to the degree of urgency
2. Suitable corrective/preventive actions plans are developed
3. Suitable tools and methods of corrective / preventive actions are proposed and implemented
4. Implemented corrective action are followed up using suitable verification methods

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the impact of food safety lapses on food industry
- 1.2 Explain the importance of conducting follow-up activities on corrective actions
- 1.3 Explain the difference between corrective and preventive actions
- 1.4 Describe the components of a non-conformity report
- 1.5 Explain the type of preventive actions/control measures implemented in food industry
- 1.6 Explain the types of corrective actions implemented in food industry when CCP fails

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Conduct corrective/preventive actions
- 3.2 Verify the effective implementation of corrective actions using suitable methods
- 3.3 Develop plan and methods for corrective/preventive actions

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 4

A. Tools

No.	Description	Unit	Quantity
1	Laptop (for completion of records) (កុំព្យូទ័រដៃ)	units	5
2	Clip board (សារធីត្តារ)	sets	20

3	Weighing balance (up to 200g; readability 0.01g) (ជញ្ជីងថ្លឹង)	units	2
4	Weighing balance (up to 2kg; readability 0.01g) (ជញ្ជីងថ្លឹង)	units	2
5	Kitchen tools (cutting boards, spoons, knives, forks, mixing bowls, knives, strainers / colanders) សម្ភារៈផ្ទះបាយ (ជ្រៀម ចាស់ កាំបិត ស្លាបព្រា សម ចាន កម្រាំង កន្ត្រែង)	sets	10

B. Equipment

No.	Description	Unit	Quantity
1	Chiller (ទូរត្តាស)	unit	1
2	Freezer (ទូរកក)	unit	1
3	Sterilizer (ម៉ាស៊ីនស្តេរីល)	unit	1
4	Pasteurizer (ម៉ាស៊ីនប៉ាស្ត័រ)	unit	1
5	Cooking unit (ឧបករណ៍ចម្អិន)	units	2
6	Blast chiller /freezer (ទូរត្តាស/កក)	unit	1
7	Hot-holding cabinet (ទូរកម្សាន្តក្តៅ)	unit	1
8	Cold-holding cabinet (ទូរកម្សាន្តត្រជាក់)	unit	1
9	Combinational oven (ម៉ាស៊ីនដុតពហុមុខងារ)	units	2

C. Materials

No.	Description	Unit	Quantity
1	Corrective and preventive actions forms (CAPA form)	sets	10
2	Hazard audit tables / plan	sets	20
3	HACCP /ISO22000 records and forms	sets	20
4			
5			

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO5. Carry out logging and documentation

Assessment Criteria:

1. Relevant documents and records are prepared and maintained for the implemented food safety management systems
2. Procedure for documents and records is implemented in accordance with established standards / regulations and requirements
3. Non-conformances relating to documentation and logging is identified and reported to the relevant personnel
4. Corrective action(s) is/are proposed and documented for the non-conformances identified.

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of documentation of corrective actions into new procedures / SOPs
- 1.2 Describe the requirements for good record keeping and documentation
- 1.3 Explain importance of documentation of corrective action as SOPs. Explain the roles and responsibilities of different personnel who are involved in execution of the corrective or preventive action
- 1.4 Explain the procedure for reporting non-compliance
- 1.5 Explain the types of documentation required for corrective and preventive actions.

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Implement good documentation and record keeping procedures
- 3.2 Report and interpret the results of monitoring and inspection

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 5

A. Tools

No.	Description	Unit	Quantity
1	Laptop (for completion of records) (កុំព្យូទ័រ)	units	5
2			

3. Interview Test
4. Written Test

MODULES OF INSTRUCTION (5)
CORE COMPETENCIES

Course title : FOOD PROCESSING AND ANALYSIS
Unit of Competency : CONDUCT CHEMICAL ANALYSIS FOR RAW / PROCESSED AGRICULTURAL PRODUCTS
Module Title : CONDUCTING CHEMICAL ANALYSIS FOR RAW / PROCESSED AGRICULTURAL PRODUCTS

Module Descriptor :

This module covers the outcomes required to carry out chemical analysis using suitable methods and techniques to assess the quality of raw / processed agricultural products and food ingredients. These methods and techniques include sampling procedures, titrimetric methods, spectroscopic / chromatographic methods and rapid methods to evaluate chemical composition as well as to quantitate contaminants/additives present in raw / processed agricultural products. In addition, reference will be made to relevant legislative and regulatory standards to assess compliance with the set requirements.

Level of Certification: High Diploma

Nominal Duration : hrs

Learning Outcomes :

Upon completion of this module, the students/trainees should be able to:

- LO1. Prepare food samples for analysis
- LO2. Conduct titrimetric analysis
- LO3. Perform advanced instrumental analysis (chromatographic / spectroscopic techniques, rapid methods)
- LO4. Carry out proximate analysis
- LO5. Carry out maintenance of food analytical instruments
- LO6. Perform laboratory data organization, presentation and analysis

LO1. Prepare food samples for analysis

Assessment Criteria:

1. Appropriate personal protective equipment (PPE) is donned in accordance with safety requirements
2. Labware to be decontaminated is correctly identified
3. Appropriate tools/reagents and methods are used for the decontamination step
4. The decontamination step is carried out in accordance with standard procedures
5. Materials are sampled in accordance with established procedures and good manufacturing practice
 - Tools
 - Intervals
 - Methods and techniques
 - Quantities to be collected
6. Samples are appropriately handled and stored prior to analysis
7. Samples are correctly labelled and submitted for laboratory analysis

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of adhering to workplace safety according to established laboratory and equipment safety guidelines
- 1.2 Describe the sampling plans and the requirements of sample labelling prior to analysis in the food industry
- 1.3 Describe the procedures and methods / techniques for sample preparation for analytical testing
- 1.4 Explain the principles of measuring equipment that are used to prepare the required sample quantity
- 1.5 Explain the storage requirements for sample before and after analysis
- 1.6 List the appropriate sampling tools used for different sample type

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Perform planning and collecting of raw materials and products sample for chemical analysis
- 3.2 Explain the changes of chemical composition in food sample during transportation
- 3.3 Use different equipment and methods for sample collecting according to different kinds of raw materials and food products

Methodologies:

1. Lecture

2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 1

A. Tools

No.	Description	Unit	Quantity
1	ដបសំណាក (Glass Bottle)	Set	5
2	ដែកចំពុះខ្នង	Piece	5
3	ចែលចូកសំណាក (Sampling Spoon)	Set	1
4	ជញ្ជីង 5 គីឡូក្រាម (Balance)	Piece	2
5	ធុងដាក់សំណាក (Sample Container)	Set	5
6	ធុងលាងសំណាក (Sample Washing Container)	Set	5
7	ស្ពាបព្រាពិសោធន៍ (Spatulas)	Set	5
8	កែវកោណ (Erlenmeyer flask)	Set	5
9	កែវបេរីលី (Beaker)	Set	5
10	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
11	ពីប៉ែត (Pipette)	Set	5
12	ដបទឹកបិត (Squeeze Bottle)	Set	5
13	សម្ភារៈផ្ទះបាយ (ជ្រូញ ថាស កាំបិត ស្ពាបព្រា សម ទាន កញ្ចប់ កន្សោម ចង្កី ដៃកាតា ដង្ហើម កន្សែ)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនបិទទឹក (Water distiller)	Unit	1
2	ទូរទឹកកក (Refrigerator)	Unit	2
3	ទូរកក (freezer)	Unit	1
4	ម៉ាស៊ីនក្រូក (Blender)	Unit	2
5	ជញ្ជីងវិភាគ (analytical balance)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	ថង់ប្លាស្ទិច (Zipper bag)	Piece	1
2	បិទសរសេរលើសំណាក (Marker)	Box	1
3	ចានអាលុយមីញ៉ូម (Aluminum Bowl)	Piece	1
4	អាវមន្ទីរពិសោធន៍ (Lab Coat)	Piece	20

5	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
6	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
7	ក្រដាសសុវត្ថិភាព (Safety gloves)	Pair	20
8	វ៉ិទាសុវត្ថិភាព (Safety goggles)	Pair	20
9	ប្រដាប់បិទក្រដៅ (Ear plug)	Pair	20
10	ក្រដាសកំដៅ (Thermal gloves)	Pair	20
11	ក្រដាស (vinyl gloves or PE gloves)	Box	1
12	ម៉ាសក្រមុច (Face mask)	Box	1
13	សំណាញ់ក្របសក់ (Hairnet / hair cover)	Piece	1
14	ក្រដាសការពារ (Protective sleeve)	Pair	20
15	សម្ភារសម្រាប់ស្អាត (កូនក្រដៅ សំបោរ ប្រដាប់ជូតកំពល ប៉ូងលាងចាន ក្រដាសស្អាត ក្រដាសស្អាត Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO2. Conduct titrimetric analysis

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Appropriate test sample(s) and chemical agents(s) is/are collected and/or selected
3. Sample preparation is carried out in accordance with standard procedures
4. Equipment used to carry out analysis is properly set up
5. Calibration and/or measurement activities are executed in accordance with established protocol to determine the presence and/or quantity of the analyte of interest
6. Data and information from the analysis are recorded correctly in the tracking log / record sheet
7. Housekeeping is carried out after the analysis and in accordance with standard procedures
8. Waste disposal is carried out in accordance with environmental rules and regulations

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of treatment, cleaning, decontamination process and maintenance of labware for analysis work
- 1.2 Explain the precaution in titrating as described in SOP
- 1.3 List the different methods used in titrimetric analysis: conventional (manual) method and automated-titration method
- 1.4 Describe the calibration steps needed to be carried out before carrying out sample analysis
- 1.5 Describe the environmental rules and regulations pertaining to chemical waste handling and disposal
- 1.6 Explain how results are calculated and interpreted based on method of analysis

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Carry out laboratory works that are in line with GLP to generate reliable and high-quality test data
- 3.2 Use different method to evaluate chemical composition and quantitate additives / contaminants in raw materials, food ingredients and products
- 3.3 Apply principles relating to occupational safety and health (OSH) when performing laboratory tasks / activities
- 3.4 Manage laboratory wastes in accordance with established procedures to optimize safety and minimize environmental impact

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 2

A. Tools

No.	Description	Unit	Quantity
1	ឧបករណ៍ធ្វើអត្រាកម្ម (Burette)	Piece	10
2	ស្លាបព្រាពិសោធន៍ (Spatulas)	Set	5
3	កែវកោណ (Erlenmeyer flask)	Set	5
4	កែវបរសែរ (Beaker)	Set	5
5	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
6	តីប៉េត (Pipette)	Set	5
7	ដបទឹកបិត (Squeeze Bottle)	Set	5
8	ដបដាក់សូលុយស្យុង (Glass Bottle)	Set	5
9	សម្ភារៈផ្ទះបាយ (គ្រឿង ថាស កាំបិត ស្លាបព្រា សម ចាន កប្រែង កន្ត្រុង ចង្កី៖ ដៃកនា ដង្ហើប កន្ត្រែ) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ឧបករណ៍កំដៅ / ក្នុងម៉ាញេទិក (Hot plate / Magnetic stirrer)	Unit	5
2	ជញ្ជីង (Weighing balance)	Unit	2
3	ឧបករណ៍ច្រុះ (Filtration unit with pump)	Unit	2
4	ម៉ាស៊ីនអត្រាកម្ម (Karl Fischer titrators)	Unit	2
5	pH ម៉ែត្រ (pH meter)	Unit	2
6	ទូរទឹកកក (Refrigerator)	Unit	1
7	ម៉ាស៊ីនផ្គុំតិច (Votex)	Unit	5
8	ម៉ាស៊ីនក្រឡុក (Blender/Homogenizer)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	សារធាតុគីមី (TBD)	Set	1
2	ចានអាលុយមីញ៉ូម (Aluminum Bowl)	Piece	1

3	អាវមន្ទីរពិសោធន៍ (Lab Coat)	Set	20
4	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
5	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
6	តុលាមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
7	ដីនតាសុវត្ថិភាព (Safety goggles)	Pair	20
8	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
9	តុលាមដៃការពារកំដៅ (Thermal gloves)	Pair	20
10	តុលាមដៃ (vinyl gloves or PE gloves)	Box	1
11	ម៉ាសបុម (Face mask)	Box	1
12	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
13	តុលាមដៃការពារ (Protective sleeve)	Pair	20
14	សម្ភារសម្រាប់ស្អាត (កូនកំឡុង កំប៉ៅ ប្រដាប់ជូតកំពល ជុំលាងទាម ត្រាស់ដុសកែវ សាប៊ូលាងទាម Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO3. Perform advanced instrumental analysis (chromatographic / spectroscopic techniques, rapid methods)

Assessment Criteria:

1. Appropriate Personal Protective Equipment (PPE) is donned in accordance with safety requirements
2. Appropriate test sample(s) and chemical agent(s) is/are collected and/or selected
3. Sample preparation is carried out in accordance with standard procedures
4. Equipment used to carry out analysis is properly set up
5. Calibration and/or measurement activities are executed in accordance with established protocol to determine the presence and/or quantity of the analyte of interest
6. Data and information from the analysis are recorded correctly in the tracking log / record sheet
7. Housekeeping is carried out after the analysis and in accordance with standard procedures
8. Waste disposal is carried out in accordance with environmental rules and regulations

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the procedures and working principles of chemical analysis using rapid methods, titrimetric methods, spectroscopic methods, and chromatographic methods
- 1.2 Describe the basic components of a spectroscopy / chromatography system and its associated functions
- 1.3 Explain the different types of additives and their functions in food.
- 1.4 Explain the different types of toxins / contaminants and their sources
- 1.5 List of maximum residue limits / regulatory requirements of additive, toxins, and other contaminants in food
- 1.6 Describe the tools used and methods applied to determine the presence and/or quantity of the target analytes such as carbohydrate, protein, fat, moisture, ash, vitamin, minerals, additive, toxins and contaminants in food samples

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Use equipment and tools for analyzing the raw materials or products according to types and parameters
- 3.2 Prepare the sample by SOP for analyzing using different equipment/tools
- 3.3 Interpret the results and compare to standard and regulation
- 3.4 Relate identified chemical composition and quantities of additive / contaminant to product shelf-life stability, quality and safety

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 3

A. Tools

No.	Description	Unit	Quantity
1	កែវកោណ (Erlenmeyer flask)	Set	5
2	បំពង់សាក (Test tube)	Set	5
3	កែវបរិស័រ (Beaker)	Set	5
4	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
5	បាឡុងក្រិត (Volumetric flask)	Set	5
6	តីប៉ែត (កែវ 5 10 25 50 មីលីលីត្រ)	Set	5
7	ឧបករណ៍បូមតីប៉ែត (TBD) (Pipette Pumper)	Set	5
8	ដបដាក់សូលុយស្យុង (TBD)	Set	5
9	ដីឡូន (កែវ) (Glass Funnel)	Set	5
10	ឧបករណ៍ច្រោះ (Funnel)	Set	5
11	កែវបំបែកអង្គធាតុរាវ (Separating funnel)	Set	5
12	ខ្នុរម៉ាញ៉េទិច (Magnetic Stir Bar)	Set	5
13	កម្រិតរំកិល (Siever shaker)	Set	2
14	ស្លាបព្រាមន្ទីរពិសោធន៍ (Lab Spatula)	Set	5
15	ដបទឹកបិត (Squeeze Bottle)	Set	5
16	សម្ភារៈផ្ទះបាយ (ជ្រូញ ថាស កាំបិត ស្លាបព្រា សម មាន កម្រិត ក្រណាត់ ចង្កី ដក ដកដា ដង្ហើប កន្សែ)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនស្ត្រីក្រូ (Spectrophotometer)	Unit	1
2	ម៉ាស៊ីនក្រូម៉ាតូក្រាហ្វី (Chromatography systems) (optional)	Unit	1
3	ម៉ាស៊ីនវាហូត (Evaporator)	Unit	1
4	ម៉ាស៊ីនចាកកណ្តិត (Centrifuge machine)	Unit	2
5	ម៉ាស៊ីនកូរ និងកំដៅ (Hot Plate)	Unit	5
6	ម៉ាស៊ីនវ៉ុតិច (Vortex)	Unit	5
7	ម៉ាស៊ីនក្រុក (Blender/Homogenizer)	Unit	2
8	ទូរទឹកកក (Refrigerator)	Unit	1

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C. Materials

No.	Description	Unit	Quantity
1	សារធាតុគីមី (Chemicals)	Set	1
2	តេស្តត្រីប៊ុន (toxin)	Set	5
3	ក្រដាសធ្វើទម្ងន់ (Weighing Paper)	Box	1
4	ក្រដាសត្រោះ (Filter Paper)	Box	1
5	ក្រដាសpH (pH test Strips)	Box	1
6	Pair ផត (Cuvette)	Box	1
7	ធានអាណូយមីញ៉ូម (Aluminum Bowl)	Piece	1
8	ធានអាណូយមីញ៉ូម (Aluminum Bowl)	Piece	1
9	អាវមឺនីរពិសោធន៍ (Lab Coat)	Set	20
10	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
11	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
12	ស្រោមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
13	រឺនតាសុវត្ថិភាព (Safety goggles)	Pair	20
14	ប្រដាប់បិទត្រឡៀក (Ear plug)	Pair	20
15	ស្រោមដៃការពារកំដៅ (Thermal gloves)	Pair	20
16	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
17	ម៉ាសកម្រិត (Face mask)	Box	1
18	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
19	ស្រោមដៃដង (Protective sleeve)	Pair	20
20	សម្ភារសម្រាប់ស្អាត (កូនកំប្លោង កំបោះ ប្រដាប់ជូតកំពល ដុំឈាមធាន ត្រាស់ដុសរឹក សាប៊ូឈាមធាន Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO4. Carry out proximate analysis

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Appropriate test sample(s) and chemical agents(s) is/are collected and/or selected
3. Sample preparation is carried out in accordance with standard procedures
4. Equipment used to carry out analysis is properly set up
5. Calibration and/or measurement activities are executed in accordance with established protocol to determine the presence and/or quantity of the analyte of interest
6. Data and information from the analysis are recorded correctly in the tracking log / record sheet
7. Housekeeping is carried out after the analysis in accordance with standard procedures
8. Waste disposal is carried out in accordance with environmental rules and regulations

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the classification and structure of food nutrients
- 1.2 Explain the food labelling requirements for food nutrients and additives
- 1.3 Explain the principle and procedures for proximate analysis methods (carbohydrate, protein, fats, moisture and ash)
- 1.4 Describe the tools used and methods applied to determine the presence and/or quantity of the target analytes such as carbohydrate, protein, fat, moisture

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Apply skills and techniques that are essential to identifying suitable food groups and their products based on their functions
- 3.2 Use different methods and equipment for analysis macro nutrients
- 3.3 Interpret the quality of food based on results from analysis, stipulated in regulations, standard, guidance and other references

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 4

A. Tools

No.	Description	Unit	Quantity
1	ឧបករណ៍វិភាគកលីពីត (Soxhlet aparatus)	Set	5
2	កែវបេស៊ែរ (Beaker)	Set	5
3	ប៊ូយធីត (Burette)	Piece	5
4	កែវអាណ (Elenmyer)	Set	5
5	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
6	បាឡុងក្រិត (Volumetric flask)	Set	5
7	តីប៉ែត (កែវ 5 10 25 50 មីលីលីត្រ)	Set	5
8	ឧបករណ៍បូមតីប៉ែត (TBD) (Pipette Pumper)	Set	5
9	ធុងដាក់ស្លូយស្បុង (TBD) (Glass Bottle)	Set	5
10	កែវញែក (Separating funnel)	Set	5
11	ដីឡាវ (កែវ) (Glass Funnel)	Set	5
12	ឧបករណ៍ត្រោះ (Funnel)	Set	5
13	ខ្ទុះម៉ាញ៉េទិច (Magnetic Stir Bar)	Set	5
14	កម្រិតរំកិល (Siever shaker)	Set	2
15	ស្លាបព្រាមន្ទីរពិសោធន៍ (Lab Spatula)	Set	5
16	ធុងទឹកបិត (Squeeze Bottle)	Set	5
17	សម្ភារៈផ្ទះបាយ (ជ្រុង ថាស កាំបិត ស្លាបព្រា សម ទាន កម្រិតរំកិល កន្ត្រង ចង្កៀម ដក ដកដា ដង្ហើប កន្ត្រង) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនវិភាគកប្រូតេអ៊ីន (Kjedalh)	Unit	1
2	បរិក្ខារវិភាគកលីពីត (Soxhlet aparatus)	Unit	1
3	ចក្រដាសដុតកំដៅ (រូបិយមួយ Soxhlet aparatus)	Unit	5
4	ម៉ាស៊ីនអត្រាកម្ម (Karl Fischer titrators)	Unit	2
5	ឡូស្ត (Dry Oven)	Unit	1
6	ឡូស្ត (Oven)	Unit	1
7	រិហ្វ្រាក់តូម៉ែត្រ (Refractometers)	Unit	2
8	ម៉ាស៊ីនស្ត្រូកតូម៉ែត្រ (Spectrophotometer)	Unit	1
9	ម៉ាស៊ីនក្រឡុក (Blender)	Unit	2
10	pHម៉ែត្រ (pH meter)	Unit	2

11	ជញ្ជីងវិភាគ (analytical balance)	Unit	2
12	ទូរទឹកកក (Refrigerator)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	pHស្រូលុយស្យុងស្តង់ដារ (pH standard solution)	Set	2
2	ធានអាលុយមីញ៉ូម (Aluminum Bowl)	Piece	10
3	ក្រដាសធ្វើទម្ងន់ (Weighing Paper)	Box	1
4	ក្រដាសត្រោះ (Filter Paper)	Box	1
5	Pairឥត (Cuvette)	Box	1
6	អាវមន្ទីរពិសោធន៍ (Lab Coat)	Set	20
7	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
8	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
9	ត្រុយមែដសុវត្ថិភាព (Safety gloves)	Pair	20
10	ម៉ីនតាសុវត្ថិភាព (Safety goggles)	Pair	20
11	ប្រដាប់បិទត្រឡាញ់ (Ear plug)	Pair	20
12	ត្រុយមែដកំដៅ (Thermal gloves)	Pair	20
13	ត្រុយមែដ (vinyl gloves or PE gloves)	Box	1
14	ម៉ាសកម្រិត (Face mask)	Box	1
15	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
16	ត្រុយមែដព័ង (Protective sleeve)	Pair	20
17	សម្ភារសម្រាប់ស្អាត (កូនកំឡុង កំបោះ ប្រដាប់ជូតកំពល ថ្មដណាងបាន ត្រាស់ដុសកែវ សាប៊ូណាងបាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO5. Carry out maintenance of food analytical instruments

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Laboratory instruments, glassware and chemicals are properly stored in designated compartments
3. Equipment that requires maintenance is identified correctly.
4. Maintenance of equipment is carried out in accordance with the procedure given in the manual.
5. Parts found to be non-functional are documented on maintenance cards or a report
6. Record books to monitor the use and maintenance of instruments are maintained accurately.

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of performing regular maintenance of food analytical instruments
- 1.2 Explain the difference between preventive and breakdown maintenance
- 1.3 Describe the characteristics of the following two types of preventive maintenance programme performed for food analytical instruments: periodic and predictive
- 1.4 Describe the common types of consumables used during maintenance
- 1.5 Explain the various standard methods used for upkeeping equipment and sample analysis records
- 1.6 Describe the key information to be recorded and documented to ensure an effective equipment maintenance programme

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Use and maintain equipment and tools correctly
- 3.2 Prepare the standard procedure for maintaining equipment and tools

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 5

A. Tools

No.	Description	Unit	Quantity
1	Boxសម្ភារ (tools box)	Set	2
2	ទូរដាក់សម្ភារ (Cabinet)	Piece	1
3			
4			

B. Equipment

No.	Description	Unit	Quantity
1			
2			

C. Materials

No.	Description	Unit	Quantity
1	ស្បែកដីសុវត្ថិភាព (Safety shoes)	Pair	20
2	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
3	តុលាមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
4	រ៉ឺម៉កសុវត្ថិភាព (Safety goggles)	Pair	20
5	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
6	តុលាមដៃកម្ដៅ (Thermal gloves)	Pair	20

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO6. Perform laboratory data organization, presentation and analysis

Assessment Criteria:

1. Appropriate tool(s) is/are selected to record / generate / store data based on analysis method(s)
2. Data and information from the analysis are recorded correctly in the tracking log / record sheet
3. Results obtained from analysis are calculated and interpreted correctly
4. Analysis data is summarized and presented correctly to facilitate in food quality assessment and compliance with relevant regulations / standards

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the appropriate procedure of record and documentation
- 1.2 Interpret the data according to the analysis context
- 1.3 Conclude the results of analysis

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Record and manage data correctly
- 3.2 Interpret the analysis results according to each context

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 6

A. Tools

No.	Description	Unit	Quantity
1			
2			
3			
4			

B. Equipment

No.	Description	Unit	Quantity
1			
2			

C. Materials

No.	Description	Unit	Quantity
1			
2			
3			
4			
5			

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

MODULES OF INSTRUCTION (6)
CORE COMPETENCIES

Course title : FOOD PROCESSING AND ANALYSIS
Unit of Competency : OPERATE AND MAINTAIN FOOD PROCESSING EQUIPMENT
Module Title : OPERATING AND MAINTAINING FOOD PROCESSING EQUIPMENT

Module Descriptor :

This module covers the outcomes required to operate and maintain food processing equipment through performing various food processes, which include pre-treatment, drying, packaging, heat treatment and low temperature treatment of food products / raw materials / ingredients. In addition, product changeover procedures as well as the conduct of risk and safety assessment of relevant unit operations will be taught in this unit to impart essential skills and knowledge relating to hygienic and safety requirements.

Level of Certification: High Diploma

Nominal Duration : hrs

Learning Outcomes :

Upon completion of this module, the students/trainees should be able to:

- LO1. Conduct unit operation safety assessment and check (include workplace safety in food processing facilities)
- LO2. Conduct pre-treatment of raw materials
- LO3. Perform mixing of food ingredients
- LO4. Carry out thermal treatment of food products
- LO5. Perform drying techniques
- LO6. Perform packaging of food products (include smart packaging)
- LO7. Perform low temperature treatment of food products
- LO8. Perform equipment cleaning and product changeover

LO1. Conduct unit operation safety assessment and check (include workplace safety in food processing facilities)

Assessment Criteria:

1. Appropriate and clean personal protective equipment (PPE) is selected and donned in correct sequence
2. Safety and health hazards are identified correctly
3. Risk level is correctly evaluated and required control measures are established correctly
4. Risk assessment form in the prescribed format is correctly completed

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of observing proper donning sequence prior to the setup and operation of process equipment, and the consequences of not following procedures
- 1.2 Explain the purpose of operating the equipment at the correct setting and correct parameters in accordance with the SOP
- 1.3 Describe the procedure for reporting of product / process deviations impacting food safety
- 1.4 Explain the application of process-monitoring instruments
- 1.5 Describe the purpose for carrying out preventive maintenance on equipment at regular intervals

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Assess and define the occupational and health hazards that could occur during when processing food and during operation of food processing equipment/unit
- 3.2 Check and ensure the safety of equipment/unit prior to operation

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 1

A. Tools

No.	Description	Unit	Quantity
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1			
2			
3			
4			

B. Equipment

No.	Description	Unit	Quantity
1			
2			

C. Materials

No.	Description	Unit	Quantity
1			
2			
3			
4			
5			

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO2. Conduct pre-treatment of raw materials

Assessment Criteria:

1. Raw materials are prepared to the relevant specifications as stated in the established standard operating procedure (SOP)
2. Correct treatment methods is selected and applied for the pre-treatment step
3. Treatment methods are applied using correct conditions / parameters / concentrations / dosages in accordance with the established standard operating procedure (SOP).

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the various corrective measures used in food preparation to prevent, eliminate or reduce the occurrence of hazards
- 1.2 Explain the importance of selection and classification of raw materials based on characteristics such as color and size
- 1.3 Describe the various types of blanching methods

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Carry out the suitable raw material pre-treatment procedure such as washing, cutting, blanching etc. prior to processing to achieve intended quality and characteristics of finished / processed products

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 2

A. Tools

No.	Description	Unit	Quantity
1	ធុងលាងបន្លែផ្លែឈើ (Fruits/vegetable washing tank)	Set	5
2	ឆ្នាំង (Cooking pot)	Set	10
3	ធុងត្រាំ (Soaking container / tank)	Set	10
4	ជញ្ជីង (5គ.ឡ)	Piece	2

5	សម្ភារៈផ្ទះបាយ (គ្រឿង ថាស កាំបិត ស្នាបព្រា សម ទាន កាំប្រុង ក្រន្ត ចង្កឹះ ដក ដកតា ដង្កៀប កាំប្រុង Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10
6	ឧបករណ៍ចិត (មុខច្រើនផ្សេងៗ)(knife variety type)	Set	2

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនបកសំបក (Peeling machine)	Unit	1
2	ម៉ាស៊ីនចិត (slicing machine)	Unit	1
3	ទូរក្លាស (Chiller)	Unit	1
4	ទូរកក (Freezer)	Unit	1
5	ទូរសម្ងួត (Dehydrator)	Unit	1
6	ម៉ាស៊ីនស្រុះ (Blanching machine)	Unit	2
7	ម៉ាស៊ីនបង្វិលមច្រោះទឹក (Fruits/vegetables spin drying machine)	Unit	1
8	ម៉ាស៊ីនលាយ (Mixer)	Unit	4
9	ចង្រ្កានអគ្គិសនី (Induction cooker)	Unit	10
10	ជញ្ជីងអង្កាម (up to 200g; readability 0.01g)	Unit	2
11	ជញ្ជីងអង្កាម (up to 2kg; readability 0.01g)	Unit	2
12	ម៉ាស៊ីនលាងបន្លែផ្លែឈើ (Fruits/vegetable washing)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	ស្បែកដើមសុវត្ថិភាព (Safety shoes)	Pair	20
2	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
3	ស្បែកដៃសុវត្ថិភាព (Safety gloves)	Pair	20
4	រ៉ែនតាសុវត្ថិភាព (Safety goggles)	Pair	20
5	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
6	ស្បែកដៃកម្ដៅ (Thermal gloves)	Pair	20
7	ស្បែកដៃ (vinyl gloves or PE gloves)	Box	1
8	ម៉ាស៊ីនមុខ (Face mask)	Box	1
9	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
10	អាវត្រឡប់ (Apron)	Piece	20
11	ស្បែកដៃការពារ (Protective sleeve)	Pair	20

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO3. Perform mixing of food ingredients

Assessment Criteria:

1. Pre-start up safety checks are correctly carried out on the equipment prior to start up
2. Mixing equipment is set up and operated at the right parameters and in accordance with the established standard operating procedure (SOP)
3. Equipment is shut down in the correct manner in accordance with the established standard operating procedure (SOP).

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Describe the key parameters found in the monitoring form
- 1.2 Formulate the ingredients correctly based on parameters needed

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 3.1 Carry out mixing /blending /homogenizing in a safe manner and using suitable equipment to achieve desired level of homogeneity

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 3

A. Tools

No.	Description	Unit	Quantity
1	សម្ភារៈផ្ទះបាយ (ជ្រុញ ថាស កាំបិត ស្លាបព្រា សម ទាន កាំប្រាំង ក្រន្ត ចង្កី: ដក ដកនា ដង្កៀប កាំត្រែ)	Set	10
	Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)		

B. Equipment

No.	Description	Unit	Quantity
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1	ទូរក្តាស (Chiller)	Unit	1
2	ទូរក្តាត្រជាក់ (Freezer)	Unit	1
3	ម៉ាស៊ីនលាយ Unit (Mixer)	Unit	4
4	ម៉ាស៊ីនក្រូកទុក (Blender)	Unit	4
5	ម៉ាស៊ីនធ្វើឱ្យស្មើសាច់ (Homogenizer)	Unit	2
6	ជញ្ជីងអេឡិចត្រូនិច (up to 200g; readability 0.01g)	Unit	2
7	ជញ្ជីងអេឡិចត្រូនិច (up to 2kg; readability 0.01g)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
2	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
3	ស្រោមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
4	រ៉ឺម៉កសុវត្ថិភាព (Safety goggles)	Pair	20
5	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
6	ស្រោមដៃការពារកំដៅ (Thermal gloves)	Pair	20
7	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
8	ម៉ាសមុខ (Face mask)	Box	1
9	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
10	អាវរៀម (Apron)	Piece	20
11	ស្រោមដៃព័ង (Protective sleeve)	Pair	20

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test

4. Written Test

LO4. Carry out thermal treatment of food products

Assessment Criteria:

1. Equipment safety checks are carried out in accordance with pre-start up safety checks
2. Thermal treatment equipment / unit is set up and operated at the right parameters in accordance with the established standard operating procedure (SOP)
3. Heating process is monitored and the end point of the heating process is identified correctly in accordance with the time and temperature of each end product needs
4. Equipment or unit is shut down in the correct manner in accordance with the established standard operating procedure (SOP).

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the purpose of using the tubular heat exchanger and plate heat exchanger for the pasteurization of food products
- 1.2 Explain the purpose of critical limits for monitoring of product / process deviations impacting food safety
- 1.3 Describe the different types of sanitizing agents used for sanitization
- 1.4 Explain the safety precautions to be followed throughout the pasteurization / sterilization process
- 1.5 Explain the various pumps and valves involved in the operation of the pasteurizer
- 1.6 Explain the importance of setting the correct time and temperature for thermal processing

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 1.1 Operate heat treatment equipment/units (e.g., cooking device, sterilizing unit, pasteurizing unit, roasting device, concentrating device, etc.) in a safe manner to produce safe food products

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 4

A. Tools

No.	Description	Unit	Quantity
1	ចម្រងប្លាស្ទិក (Cooking unit)	Set	2
2	សម្ភារៈផ្ទះបាយ (ក្រដាស ថាស កាំបិត ស្លាបព្រា សម ធាន កាំបិត ក្រន្ត ចង្កៀម ម៉ក ម៉កដា ដង្ហើម កាំបិត) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនបំពង (Deep dryer)	Unit	1
2	ទូរក្តាស (Chiller)	Unit	1
3	ទូរក្តៅ (Freezer)	Unit	1
4	ម៉ាស៊ីនលាយ (Mixer)	Unit	4
5	ម៉ាស៊ីនក្រឡុក (Blender)	Unit	4
6	ម៉ាស៊ីនធ្វើឱ្យស្មើ (Homogenizer)	Unit	2
7	ម៉ាស៊ីនស្តេរីល (Sterilizer)	Unit	1
8	ម៉ាស៊ីនប៉ាស្ត័រកម្ម (Pasteurizer)	Unit	1
9	ទូរដុត (Roasting unit)	Unit	2
10	ជញ្ជីងអេឡិចត្រូនិក (up to 200g; readability 0.01g)	Unit	2
11	ជញ្ជីងអេឡិចត្រូនិក (up to 2kg; readability 0.01g)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
2	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
3	ស្រោមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
4	រ៉ែនតាសុវត្ថិភាព (Safety goggles)	Pair	20
5	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
6	ស្រោមដៃកម្ដៅ (Thermal gloves)	Pair	20
7	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
8	ម៉ាស៊ីនមុខ (Face mask)	Box	1
9	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
10	អាវដង្ហើម (Apron)	Piece	20

11	ស្រោមដៃការពារ (Protective sleeve)	Pair	20

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO5. Perform drying techniques

Assessment Criteria:

1. Temperature of the drying equipment is set and operated at the correct temperature in accordance with the principles of food dehydration
2. Food is positioned correctly inside the drying unit and drying method is performed at the correct processing parameters (e.g., time limit and temperature) in accordance with the SOP of each drying method
3. Dried food is removed from the dryer after the completion of the process
4. Equipment or unit is shut down in the correct manner in accordance with the established standard operating procedure (SOP)

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the process of operating the dryer at the specified temperature and time in accordance with the SOP for food products
- 1.2 Explain the reasons to place food in the dryer within specified distances between them during the process of drying
- 1.3 Describe the process of drying
- 1.4 Explain the common problems encountered during drying and how they could be resolved

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 1.2 Carry out drying / dehydration processes using suitable equipment (e.g., sun light dryer, solar dryer, hot air oven, spray dryer, etc.) in a safe manner to produce food products of desired moisture content /water activity value for shelf stability

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 5

A. Tools

No.	Description	Unit	Quantity
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1	សម្ភារៈផ្ទះបាយ (ផ្រូញ ថាស កាំបិត ស្នាបព្រា សម ចាន កាំបិត ក្រន្ត ចង្កឹះ ដក ដកតា ដង្ហុប កាំបិត) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ទូរក្តៅស (Chiller)	Unit	1
2	ទូរក្តៅត្រជាក់ (Freezer)	Unit	1
3	ទូរសម្ងួត (Food dehydrator)	Unit	4
4	ទូរសម្ងួតដោយពន្លឺព្រះអាទិត្យ (Solar dryer)	Unit	1
5	ទូរសម្ងួតដោយខ្យល់ក្តៅ (Hot air dryer)	Unit	1
6	ទូរសម្ងួតដោយបាញ់ជាតិណែក (Spray dryer)	Unit	1
7	ទូរសម្ងួតត្រជាក់ (Freezer dryer)	Unit	1
8	ជញ្ជីងអេឡិចត្រូនិច (up to 200g; readability 0.01g)	Unit	2
9	ជញ្ជីងអេឡិចត្រូនិច (up to 2kg; readability 0.01g)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
2	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
3	ស្រោមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
4	កញ្ចប់ការពារភ្នែក (Safety goggles)	Pair	20
5	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
6	ស្រោមដៃកម្រិតកំដៅ (Thermal gloves)	Pair	20
7	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
8	ម៉ាសកម្រិត (Face mask)	Box	1
9	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
10	អាវស្រោម (Apron)	Piece	20
11	ស្រោមដៃការពារ (Protective sleeve)	Pair	20

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2

5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO6. Perform packaging of food products (include smart packaging)

Assessment Criteria:

1. Pre-start up safety checks are correctly carried out on the equipment prior to start up
2. Packaging equipment / unit is set up and operated at the right parameters and in accordance with the established standard operating procedure (SOP) of respective equipment/ packaging unit
3. Food products are packed in the correct manner in accordance with SOP of respective equipment/packaging unit
4. Equipment or unit is shut down in the correct manner in accordance with the established standard operating procedure (SOP).

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

1.1 Explain the working principle of the various packaging equipment:

- MAP machine
- Vacuum pack machine

Explain the purpose of packing the food products in accordance with SOP for various

1.2 Explain the importance of carrying out safety checks on the flexible form fill seal machine prior to the start-up of the equipment

1.3 Explain the purpose of checking the integrity of the seal

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

1.3 Implement suitable food packaging technologies (e.g., vacuum machine, MAP machine etc.) in a safe manner to protect food from contamination and to improve product shelf life

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 6

A. Tools

No.	Description	Unit	Quantity
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1	សម្ភារៈផ្ទះបាយ (ជ្រុង ថាស កាំបិត ស្លាបព្រា សម ចាន កាំបិត ក្រដាស ចង្កឹះ ដក ដកតា ដង្ហុប កាំបិត) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ទូរក្តៅស (Chiller)	Unit	1
2	ទូរក្តៅ (Freezer)	Unit	1
3	ម៉ាស៊ីនប្រកប (Canning equipment)	Unit	1
4	ម៉ាស៊ីនដេញខ្ទប់អាក្ស័យ (Vacuum packaging equipment)	Unit	1
5	ម៉ាស៊ីនដេញខ្ទប់ដោយតែប្រៃសម្ពាធ (MAP machine)	Unit	1
6	ម៉ាស៊ីនដេញខ្ទប់ប្លាស្ទិក (Plastic packaging device)	Unit	1
7	ម៉ាស៊ីនជ្រុំនិងប្រកប (Filling and Bottling equipment)	Unit	1
8	ជញ្ជីងអេឡិចត្រូនិក (up to 200g; readability 0.01g)	Unit	2
9	ជញ្ជីងអេឡិចត្រូនិក (up to 2kg; readability 0.01g)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
2	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
3	ស្រោមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
4	កញ្ចក់សុវត្ថិភាព (Safety goggles)	Pair	20
5	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
6	ស្រោមដៃកម្រិតកំដៅ (Thermal gloves)	Pair	20
7	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
8	ម៉ាស៊ីនមុខ (Face mask)	Box	1
9	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
10	អាវត្រែង (Apron)	Piece	20
11	ស្រោមដៃការពារ (Protective sleeve)	Pair	20

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2

6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO7. Perform low temperature treatment of food products

Assessment Criteria:

1. Equipment for low temperature treatment is set up and operated at the right parameters and in accordance with the established standard operating procedure (SOP)
2. Food is portioned / packed / positioned correctly prior to low temperature treatment
3. Process monitoring of the treatment process is carried out in accordance with the established standard operating procedure (SOP)
4. Equipment is shut down in the correct manner in accordance with the established standard operating procedure (SOP).

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of chilling food at the correct temperature and time
- 1.2 List the different types of low temperature treatment equipment and processes
- 1.3 Explain the applying of different temperature (chilling and freezing) for different food products

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 1.4 Carry out low temperature processing using suitable equipment (e.g., chiller, freezer, blast chiller / freezer, IQF freezer) operating under appropriate processing parameters to maintain food quality and safety

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 7

A. Tools

No.	Description	Unit	Quantity
1	សម្ភារៈផ្ទះបាយ (ជ្រុង ថាស កាំបិត ស្នាមប្រា សម ចាន កាំប្រុង កន្ស័យ ចង្កៀរ ដក ដកតា ដង្កៀប កាំប្រុង) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

2			
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B. Equipment

No.	Description	Unit	Quantity
1	ទូរក្លាស់ (Chiller)	Unit	1
2	ទូរក្លាស់ (freezer)	Unit	1
3	ទូរក្លាស់ប្រតិបត្តិ (Blast chiller /freezer)	Unit	1
4	បរិក្ខារស្ងួតក្រដាត (Freeze dryer)	Unit	1
5	ម៉ាស៊ីនផលិតកាត់ទឹក (Ice cream machine)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
2	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
3	ស្រោមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
4	វ៉ែនតាសុវត្ថិភាព (Safety goggles)	Pair	20
5	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
6	ស្រោមដៃការពារកំដៅ (Thermal gloves)	Pair	20
7	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
8	ម៉ាសមុខ (Face mask)	Box	1
9	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
10	អាវអៀម (Apron)	Piece	20
11	ស្រោមដៃព័ង (Protective sleeve)	Pair	20

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation

3. Interview Test
4. Written Test

LO8. Perform equipment cleaning and product changeover

Assessment Criteria:

1. General safety/hygiene requirements are followed throughout the process
2. Safety precautions are verified before starting the equipment in accordance with the standard operating procedure (SOP) for pre-start up
3. safety checks SOP
4. Equipment is correctly set up for product changeover in accordance with the established standard operating procedure (SOP)
5. Product changeover is implemented smoothly
6. Process of product changeover is properly documented

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the established procedures, operation pertaining to product changeover and the importance of proper changeover
 - 1.2 Explain the safety precautions observed during product changeover
 - 1.3 Explain the safety precautions to be observed for safe cleaning and sanitization process
 - 1.4 Describe the types of soil found in the food processing equipment
 - 1.5 Explain the importance of cleaning in food premises
 - 1.6 Explain the various methods used for the cleaning of process equipment
 - 1.7 Describe the various sanitization methods and their importance
- Explain different reagents used for sanitation
- 2.1 Explain the important process variables and the importance of monitoring these variables during the changeover operation

1.2

1.3

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 1.5 Perform cleaning / sanitizing and product changeover procedures in accordance with established protocol for the control of contamination and allergens

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities

11	គ្រឿងការពារដៃ (Protective sleeve)	Pair	20
12	សាប៊ូលាងឧបករណ៍ (food grade washing detergent)	គ្រឿង	2

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

MODULES OF INSTRUCTION (7)
CORE COMPETENCIES

Course title : FOOD PROCESSING AND ANALYSIS
Unit of Competency : APPLY FOOD PRESERVATION AND PROCESSING TECHNOLOGIES
Module Title : APPLYING FOOD PRESERVATION AND PROCESSING TECHNOLOGIES

Module Descriptor :

This module covers the outcomes required to carry out food preservation and processing using suitable method and technologies to enhance the quality and safety of processed products. Key methods and technologies covered in this unit include application of chemical and physical methods as well as fermentation, that are essential in the preservation and value-addition of processed agricultural products. In addition, reference will be made to relevant legislative and regulatory standards to assess compliance with the set requirements.

Level of Certification: High Diploma

Nominal Duration : hrs

Learning Outcomes :

Upon completion of this module, the students/trainees should be able to:

- LO1. Apply chemical preservation methods
- LO2. Carry out physical food preservation methods (e.g., high pressure processing, pulsed electric fields, radiation -ionising/non-ionising, ohmic heat)
- LO3. Perform food bioprocessing techniques (fermentation)

LO1. Apply chemical preservation methods

Assessment Criteria:

1. Appropriate Personal Protective Equipment (PPE) is donned in accordance with safety requirements
2. Chemical additives for food preservation are correctly used as per recommended in the safety data sheet (SDS)
3. Appropriate chemical(s) is/are selected in accordance with food materials / processing techniques to obtain the desired food quality
4. Appropriate quantity / ratio / concentration of preservatives is applied in accordance with standard procedure / method / regulatory requirement
5. Proper documentation and logging are performed in accordance with standard procedures
6. Housekeeping is carried out in accordance with standard operation procedure (SOP).

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 List the different types of food preservative and their functions in food application
- 1.2 Describe the principle of food preservation (chemical and physical preservative) for different type of food
- 1.3 Describe the quantity / concentration / ratio of preservative used in food processing
- 1.4 Describe the procedures for improving food quality and self-life through food preservative techniques
- 1.5 Explain the impact of preservative techniques and use of chemical on food quality
- 1.6 Explain the purpose of critical limits of chemical preservative impacting food safety
- 1.7 Describe the environmental rules and regulations pertaining to chemical / biological waste handling and disposal

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 1.6 Use different chemicals and techniques to preserve raw materials, food ingredients and products
- 1.7 Relate specific food products based on their functions, properties and characteristics to type of preservation techniques for shelf-life stability, quality and safety
- 1.8 Apply skills and techniques that are essential to achieve the cleanness in working environment to reduce/eliminate the physical / chemical /microbial contamination
- 1.9 Manage generated wastes in accordance with established procedures to optimize safety and minimize environmental impact

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 1

A. Tools

No.	Description	Unit	Quantity
1	កែវបេស៊ែ (Beaker)	Set	5
2	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
3	ធុងលាងបន្លែផ្លែឈើ (Fruits/vegetable washing tank)	Set	5
4	ឆ្នាំង (Cooking pot)	Set	10
5	ចម្រុះប្រកាស (Cooking unit)	Set	2
6	ធុងត្រាំ (Soaking container / tank)	Set	10
7	ឧបករណ៍ចិត (មុខម្រើនជម្រើស)	Set	2
8	ជញ្ជីង (5គ.ឡ)	Piece	2
9	សម្ភារៈផ្ទះបាយ (ជ្រូញ ថាស កាំបិត ស្លាបប្រា សម ទាន កប្បី ក្រនុង ចង្កី ដក ដកដា ដង្ហើប កន្រ្តី Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនក្ដូរ / កម្ដៅ (Hot Plate)	Unit	5
2	pH ម៉ែត្រ (pH Meter)	Unit	2
3	រិប្រូតូម៉ែត្រ (Refractometer)	Unit	2
4	ម៉ាស៊ីនក្រឡុក (Blender)	Unit	2
5	ទូរក្ដាស (Chiller)	Unit	1
6	ទូរក្ដាត (Freezer)	Unit	1
7	ទូរស្ងួត (Dehydrator)	Unit	1
8	ម៉ាស៊ីនលាយ (Mixer)	Unit	4
9	ចម្រុះអគ្គិសនី (Induction cooker)	Unit	10
10	ជញ្ជីងអេឡិចត្រូនិក (up to 200g; readability 0.01g)	Unit	2
11	ជញ្ជីងអេឡិចត្រូនិក (up to 2kg; readability 0.01g)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	Unit ផ្សំ (អំបិល ស្ករ ប៊ីចេង ទឹកខ្លះជាដើម) Ingredient (Salt, Sugar, MSG, Vinegar)	Set	2
2	សារធាតុគីមី (សូដ្យូមបង់សូអាត អាស៊ីតបង់សូអ៊ីច នីត្រាត /នីត្រិក ស៊ុលហ្វីត សូដ្យូមសរណាត ប៉ូតាស្យូមសរណាត) Chemical substance (Sodium benzoate, Benzoic Acid, Nitrate/Nitric, Sulphite, Sodium Solbate, Potasium Solbate)	Set	2
3	ថង់ប្លាស្ទិច (Zipper bag)	Piece	1
4	ប៊ិចសរសេរលើសំណាក (Marker)	Box	1
5	ចានអាលុយមីញ៉ូម (Aluminum Bowl)	Piece	1
6	អាវមន្ទីរពិសោធន៍ (Lab Coat)	Piece	20
7	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
8	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
9	តុលាមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
10	ដំឡើងពន្លឺសុវត្ថិភាព (Safety goggles)	Pair	20
11	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
12	តុលាមដៃកម្ដៅ (Thermal gloves)	Pair	20
13	តុលាមដៃ (vinyl gloves or PE gloves)	Box	1
14	ម៉ាសកុម (Face mask)	Box	1
15	សំណាញ់ក្របសក់ (Hairnet / hair cover)	Piece	1
16	តុលាមដៃព័ង (Protective sleeve)	Pair	20
17	សម្ភារសម្អាតទូទៅ (កូនកំឡុង កំបោះ ប្រដាប់ជូតកំពល ប៉ូងលាងចាន ត្រាស់ដុសកែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO2. Carry out physical food preservation methods (e.g., high pressure processing, pulsed electric fields, radiation -ionising/non-ionising, ohmic heat)

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. Checks on safety and hygiene requirements is performed prior to application of the preservation methods
3. Appropriate methods / equipment is correctly selected and used to achieve desired product quality
4. Equipment is operated at the correct parameters and in accordance with standard operation procedure (SOP)
5. Processes or products not meeting the quality standards / critical limit is recorded / reported to the appropriate authorized personnel
6. Appropriate corrective action(s) / measure(s) is/are implemented for any observed deviation(s)
7. Processed / treated product is appropriately handled and stored in accordance with standard operation procedure (SOP)
8. Equipment is shut down in the correct manner in accordance with standard operation procedure (SOP)
9. Proper documentation and logging are performed in accordance with standard procedure
10. Housekeeping is carried out in accordance with standard operation procedure (SOP).

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of treatment, cleaning, decontamination process and maintenance of equipment / tools for food processing
- 1.2 Explain the impact of equipment parameter / deviation on food quality
- 1.3 Explain the purpose of operating the equipment at the correct setting and correct parameters in accordance with the SOP
- 1.4 Describe the importance of preventive maintenance on equipment at regular intervals
- 1.5 Describe the key information to be recorded and documented to ensure an effective equipment maintenance programme
- 1.6 Explain the objective of monitoring process parameters
- 1.7 Explain the process of operating the equipment at the specified parameters, such as temperature, pressure and time in accordance with the SOP for food products

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 1.10 Apply techniques to preserve raw materials, ingredients and food products

- 1.11 Apply principles relating to occupational safety and health (OSH) when handling equipment / tools
- 1.12 Apply skills and techniques that are essential to handle and set up equipment parameters to achieve the desirable product quality

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 2

A. Tools

No.	Description	Unit	Quantity
1	កែវបេស៊ែ (Beaker)	Set	5
2	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
3	ធុងលាងបន្លែផ្លែឈើ (Fruits/vegetable washing tank)	Set	5
4	ឆ្នាំង (Cooking pot)	Set	10
5	ចម្រានហ្គាស (Cooking unit)	Set	2
6	ធុងត្រាំ (Soaking container / tank)	Set	10
7	ឧបករណ៍ចិត (មុខច្រើនជម្រើស) (knife – variety type)	Set	2
8	ជញ្ជីង (5គ.ឡ) (Balance Max. 5kg)	Piece	2
9	សម្ភារៈផ្ទះបាយ (ជ្រូញ ថាស កាំបិត ស្លាបព្រា សម ទាន កង្កែប ក្រនុង ចង្កី ដក ដកតា ដង្កៀប កង្កែប Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនកាំរស្មីអ៊ុលត្រាវីយូឡេ (UV Machine)		
2	ម៉ាស៊ីនវិទ្យុសកម្មមីក្រូរលក (Radiation Microwave)		
3	ម៉ាស៊ីនបំពង (Deep dryer)	Unit	1
4	ទូរក្តាស (Chiller)	Unit	1
5	ទូរក្តាស (Freezer)	Unit	1
6	ទូរក្តាសប្រភព (Blast chiller /freezer)	Unit	1
7	ម៉ាស៊ីនលាយ (Mixer)	Unit	4
8	ម៉ាស៊ីនក្រុក (Blender)	Unit	4
9	ម៉ាស៊ីនធ្វើឱ្យស្មើសាច់ (Homogenizer)	Unit	2

10	ម៉ាស៊ីនស្តេរីលីស (Sterilizer)	Unit	1
11	ម៉ាស៊ីនប៉ាស្ត័រកម្ម (Pasteurizer)	Unit	1
12	ទូរស្រព្វ (Food dehydrator)	Unit	4
13	ទូរស្រព្វដោយពន្លឺព្រះអាទិត្យ (Solar dryer)	Unit	1
14	ទូរស្រព្វដោយខ្យល់ក្តៅ (Hot air dryer)	Unit	1
15	ទូរស្រព្វដោយបាញ់ជាតិណក់ (Spray dryer)	Unit	1
16	ទូរស្រព្វត្រជាក់ (Freezer dryer)	Unit	1
17	ជញ្ជីងអេឡិចត្រូនិក (up to 200g; readability 0.01g)	Unit	2
18	ជញ្ជីងអេឡិចត្រូនិក (up to 2kg; readability 0.01g)	Unit	2
19	ម៉ាស៊ីនដេឡាម៉ាញ៉ូម (Vacuum packaging equipment)	Unit	1
20	ម៉ាស៊ីនដេឡាម៉ាញ៉ូមប្រែប្រួលសម្ពាធ (MAP machine)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	Unit ផ្សំ (អំបិល ស្ករ ប៊ីចេង ទឹកខ្លះជាដើម) Ingredient (Salt, Sugar, MSG, Vinegar)	Set	2
2	សារធាតុគីមី (សូដ្យូមបង់សូអាត អាស៊ីតបង់សូអ៊ីក ទីត្រាត / ទីត្រីត ស៊ុលហ្វីត សូដ្យូមសរីរាគមន៍ ប៉ូតាស្យូមសរីរាគមន៍) Chemical substance (Sodium benzoate, Benzoic Acid, Nitrate/Nitric, Sulphite, Sodium Solbate, Potassium Solbate)	Set	2
3	ថង់ប្លាស្ទិក (Zipper bag)	Piece	1
4	ប៊ិចសរសេរលើសំណាក (Marker)	Box	1
5	ធានអាណូយមីញ៉ូម (Aluminum Bowl)	Piece	1
6	អាវបង្ការពិសោធន៍ (Lab Coat)	Piece	20
7	ស្បែកដើមសុវត្ថិភាព (Safety shoes)	Pair	20
8	ធាតសណ្ឋានការងារ (Safety work uniform)	Set	20
9	ស្រោមដៃសុវត្ថិភាព (Safety gloves)	Pair	20
10	ដំឡើងសុវត្ថិភាព (Safety goggles)	Pair	20
11	ប្រដាប់បិទត្រឡាញ់ (Ear plug)	Pair	20
12	ស្រោមដៃកំដៅ (Thermal gloves)	Pair	20
13	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
14	ម៉ាស៊ីនមាត់ (Face mask)	Box	1
15	សំណាញ់ក្របសក់ (Hairnet / hair cover)	Piece	1
16	ស្រោមដៃការពារ (Protective sleeve)	Pair	20

17	សម្ភារសម្រាប់ស្អាត (កូនកំឡុង គំរោង: ប្រដាប់ជូតកំរាល ប៉ូងលាងចាន ត្រាស់ដុលវ៉ែក សាប៊ូលាងចាន Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO3. Perform food bioprocessing techniques (fermentation)

Assessment Criteria:

1. Appropriate PPE is donned in accordance with safety requirements
2. General safety and hygiene requirements are correctly followed throughout the process
3. Suitable tools / equipment are correctly selected and used to achieve desired product quality
4. Appropriate decontamination is performed on the tools in accordance with standard operation procedure (SOP)
5. Suitable food ingredients and/or methods are correctly selected and used to achieve desired product quality
6. Fermentation is carried out in accordance with established standard operation procedure (SOP)
7. Proper documentation and logging are performed in accordance with standard procedure
8. Processing wastes are disposed of safely and in compliance with regulatory requirements
9. Housekeeping is carried out in accordance with standard operation procedure (SOP).

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the principles and types of fermentation
- 1.2 List different types of starter culture for fermentation process
- 1.3 Describe the procedure for fruit and vegetable fermentation
- 1.4 Describe the procedure for meat and dairy product fermentation
- 1.5 Explain the importance of treatment, washing and decontamination of raw material and food ingredient
- 1.6 Explain the impact of fermentation condition (Temperature, pH, substrate, oxygen, etc.) on fermented products
- 1.7 Explain the common problems encountered during fermentation and how they could be resolved

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following

- 1.13 Apply preservation skills and techniques that are relevant to requirement in regulations / standards / guidelines / specifications to ensure the consumer safety
- 1.14 Apply skills and techniques that are essential to select correct starter culture, fermentation condition based on characteristic of food product

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 3

A. Tools

No.	Description	Unit	Quantity
1	ធុងជីវប្រតិកម្ម (Bioreactor)	Piece	2
2	ធុង / ពាងសម្រាប់ធ្វើល្បីង (Fermented Jar)	Set	5
3	កែវបេស៊ែ (Beaker)	Set	5
4	កែវកោណ (Erlenmeyer Flask)	Set	5
5	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
6	ធុងលាងបន្លែផ្លែឈើ (Fruits/vegetable washing tank)	Set	5
7	ឆ្នាំង (Cooking pot)	Set	10
8	ឧបករណ៍ចម្រុះ (Cooking unit)	Set	2
9	ធុងត្រាំ (Soaking container / tank)	Set	10
10	ជញ្ជីង (5គ.ឡ)	Piece	2
11	សម្ភារផ្ទះបាយ (គ្រឿង ថាស កាំបិត ស្លាបព្រា សម ទាន កប្រៃ ក្រនុង ចង្កី ដក ដកដា ដង្ហើម កន្សៃ Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10

B. Equipment

No.	Description	Unit	Quantity
1	ទូរចម្រុះ (Incubator)	Unit	1
2	ទូរចម្រុះដោយក្រឡុក (Shaking incubator)	Unit	2
3	ទូរត្រជាក់ (Chiller)	Unit	1
4	ទូរកក (Freezer)	Unit	1
5	ម៉ាស៊ីនលាយ (Mixer)	Unit	4
6	ម៉ាស៊ីនក្រឡុក (Blender)	Unit	4
7	ម៉ាស៊ីនស្តេរីល (Sterilizer)	Unit	1
8	ម៉ាស៊ីនប៉ាស្ត័រកម្ម (Pasteurizer)	Unit	1
9	pHម៉ែត្រ (pH meter)	Unit	2
10	រិប្រូតូម៉ែត្រ (Refractometer)	Unit	2

11	ជញ្ជីងអេក្រូម៉ែត្រ (up to 200g; readability 0.01g) (Balance)	Unit	2
12	ជញ្ជីងអេក្រូម៉ែត្រ (up to 2kg; readability 0.01g)	Unit	2

C. Materials

No.	Description	Unit	Quantity
1	សារធាតុគីមី (សូដ្យូមបង់សូអ៊ាត អាស៊ីតបង់សូអ៊ិច នីត្រាត /នីត្រិក ស៊ុលហ្វីត សូដ្យូមសរណាត ប៉ូតាស្យូមសរណាត) Chemical substance (Sodium benzoate, Benzoic Acid, Nitrate/Nitric, Sulphite, Sodium Solbate, Potassium Solbate)	Set	2
2	ប៊ិចសរសេរលើសំណាក (Marker)	Box	1
3	អាវមន្ទីរពិសោធន៍ (Lab Coat)	Piece	20
4	ស្បែកជើងសុវត្ថិភាព (Safety shoes)	Pair	20
5	ឯកសណ្ឋានការងារ (Safety work uniform)	Set	20
6	ក្រសាលសុវត្ថិភាព (Safety gloves)	Pair	20
7	រ៉ឺម៉កសុវត្ថិភាព (Safety goggles)	Pair	20
8	ប្រដាប់បិទត្រចៀក (Ear plug)	Pair	20
9	ក្រសាលការពារកំដៅ (Thermal gloves)	Pair	20
10	ក្រសាល (vinyl gloves or PE gloves)	Box	1
11	ម៉ាសក្រមុច (Face mask)	Box	1
12	សំណាញ់ក្របសក់ (Hairnet / hair cover)	Piece	1
13	ក្រសាលដៃ (Protective sleeve)	Pair	20
14	សម្ភារសម្អាតផ្សេងៗ (កូនកំប្លោង កំបោះ ប្រដាប់ជូតកំពល ប៉ុងលាងចាន គ្រាប់ដុសរ៉ែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

MODULES OF INSTRUCTION (8)
CORE COMPETENCIES

Course title : FOOD PROCESSING AND ANALYSIS
Unit of Competency : MAINTAIN NUTRITIONAL QUALITY OF RAW /
PROCESSED AGRICULTURAL PRODUCTS
Module Title : MAINTAINING NUTRITIONAL QUALITY OF RAW /
PROCESSED AGRICULTURAL PRODUCTS

Module Descriptor :
This module covers the outcomes required to carry out maintaining nutritional quality of raw / processed agricultural products using suitable methods / techniques to assess and maintain the nutritional quality to meet consumer dietary requirements. Those methods / techniques include identifying factors affecting nutritional quality, evaluating nutritional properties using suitable methods / equipment, conducting dietary requirement assessment, recommending dietary plan, etc.

Level of Certification: High Diploma

Nominal Duration : hrs

Learning Outcomes :

Upon completion of this module, the students/trainees should be able to:

- LO1. Identify factors affecting nutritional quality of food (Identify nutritional risk factors)
- LO2. Identify key nutrients (macro and micro-nutrients) and their associated functions
- LO3. Assess food products in meeting nutrient needs
- LO4. Recommend diet plan/product based on dietary needs/requirements using suitable tools (e.g. nutrient databases, food composition tables, Healthy Eating Plate, etc).

LO1. Identify factors affecting nutritional quality of food (Identify nutritional risk factors)

Assessment Criteria:

1. Key risk factors (intrinsic and extrinsic factors) that impact the nutritional quality of food are identified accurately
2. Impacts of each factor are correctly analysed
3. Correct processing techniques / Preventive measures that need to be undertaken to maintain nutritional quality of foods are identified appropriately

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the key nutrients present in food, including carbohydrate, fat, protein, vitamin, mineral and water and their functions
- 1.2 Explain factors affecting quality of food, including intrinsic and extrinsic factors
- 1.3 Explain the relationship between processing techniques and nutritional quality of food products
- 1.4 Describe different types of processing techniques to maintain nutritional quality of food products

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 1.5 Identify processing techniques and / or characteristics of food that will have impact on nutritional quality of products
- 1.6 Use different methods to quantify carbohydrate, fat, protein, vitamin, mineral in raw materials, food ingredients and products

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 1

A. Tools

No.	Description	Unit	Quantity
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1	សម្ភារៈផ្ទះបាយ (គ្រឿង ថាស កាំបិត ស្នាបព្រា សម ចាន កាំប្រុង កន្ត្រែង ចង្កី៖ ដក ដកតា ដង្កៀប កាំប្រុង) Kitchen accessories (Cutting Board, Tray, Knife, Spoon, Fork, Plate, Colander, Chopsticks, Spatula, Tong, Scissors)	Set	10
2	ឆ្នាំង (Pot)	Set	5
3	ខ្លួន (Pan)	Set	5
4	ខ្លួនម៉ាញ៉េទិច (Magnetic Stir Bar)	Set	5

B. Equipment

No.	Description	Unit	Quantity
1	ចម្រងឧបករណ៍ (Gas Cooker)	Unit	1
2	ចម្រងកម្ដៅ (microwave oven)	Unit	1
3	ម៉ាស៊ីនក្រូក (blender/homogenizer)	Unit	2
4	ម៉ាស៊ីនកូរ/កម្ដៅ (magnetic stirrer/heater)	Unit	2
5	ទូទឹកកក (Refrigerator)	Unit	1
6	ទូបង្កក (Freezer)	Unit	1
7	ទូរត្រជាក់ (Chiller)	Unit	1
8	ធាតុវិភាគ (Analytical Balance)	Unit	2
9	ម៉ាស៊ីនឆ្លុះ (Vortex)	Unit	5
10	ឧបករណ៍បិទទឹក (Distilled Water Machine)	Set	1
11	ឧបករណ៍កំដៅ/កូរម៉ាញ៉េទិច (Magnetic heater/stirrer)	Unit	5
12	ម៉ាស៊ីនកម្ដៅទឹក (Water bath)	Unit	1
13	ម៉ាស៊ីនកម្ដៅទឹកមានរំញ័រ (Shaking water bath)	Unit	1
14	ឡស្ងួត (Dry oven)	Unit	1
15	ម៉ាស៊ីនរំញ័រដោយសីលសង (Sonicator with controlled temperature)	Unit	1
16	pHម៉ែត្រ (pH meter)	Unit	5

C. Materials

No.	Description	Unit	Quantity
1	ស្រោមដៃ (vinyl gloves or PE gloves)	Box	1
2	ម៉ាសមុខ (Face mask)	Box	1
3	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
4	អាវបង្ក្រាប (lab Coat)	Set	20
5	ស្បែកដើមជម្រាប (Safety Shoes)	Pair	20
6	កញ្ចក់សុវត្ថិភាព (Safety Goggles)	Set	20
7	ស្រោមដៃកំដៅ (Thermal gloves)	Pair	20

8	ក្រណាត់ការពារ (Protective sleeve)	Pair	20
9	សម្ភារសម្អាតទូទៅ (ក្រដាសជូត កូនកន្សែង អំបោះ ប្រដាប់ជូតកំពស់ ប៉ុងលាងចាន ប្រាស់ដុសកែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10
10	សារធាតុគីមី (Chemical Substance)	Set	1
11	ក្រដាសត្រាច្រា (Filter Paper)	Box	1
12	ក្រដាសធ្វើទម្ងន់ (Weighing Paper)	Box	1
13	ចានធ្វើទម្ងន់ (Weighing Bowl)	Box	1
14	ក្រដាសpH (pH test Strips)	Box	1
15	pHស្រូលុយស្យុងស្តង់ដារ (pH Standard Solution)	Set	1

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO2. Identify key nutrients (macro and micro-nutrients) and their associated functions

Assessment Criteria:

1. Appropriate personal protective equipment (PPE) is donned in accordance with safety and hygiene requirements
2. Test(s) is/are conducted using the appropriate method, tools and reagents
3. Test(s) is/are conducted in accordance with standard operating procedures (SOP)
4. Results based on relevant formula are correctly computed
5. Results are correctly interpreted and recorded in an approved datasheet
6. Housekeeping is carried out in accordance with SOP

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the suitable tools, instrument and equipment that are used to measure the quality parameters of food products
- 1.2 Describe the procedures for conducting carbohydrate, fat, protein, vitamin, mineral analysis

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 1.7 Use suitable processing technique to define carbohydrate, fat, protein, vitamin and mineral in raw materials and food products
- 1.8 Relate carbohydrate, fat, protein, vitamin, mineral content to nutritional quality of food products

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 2

A. Tools

No.	Description	Unit	Quantity
1	ឧបករណ៍វិភាគកសិធិត (Soxhlet apparatus)	Set	5
2	ប៊ូរ៉េត (Burette)	Piece	5

3	កែវគោណ (Elenmyer)	Set	5
4	កែវបេស៊ែរ (Beaker)	Set	5
5	បំពង់សាក (Test tube)	Box	1
6	បំពង់សាកមានគំរូ (Test tube with cap)	Box	1
7	ដើងទ្រទ្រង់បំពង់សាក (Test tube holder)	Piece	10
8	ស៊ីឡាំងក្រិត (Graduate Cylinder)	Set	5
9	បារាម្យក្រិត (Volumetric flask)	Set	5
10	ពីប៉េត (កែវ 5មីលីលីត្រ) (Glass Pipette 5ml)	Box	1
11	ពីប៉េត (កែវ 10មីលីលីត្រ) (Glass Pipette 10ml)	Box	1
12	ពីប៉េត (កែវ 25មីលីលីត្រ) (Glass Pipette 25)	Box	1
13	ពីប៉េត (កែវ 50មីលីលីត្រ) (Glass Pipette 50)	Box	1
14	ឧបករណ៍បូមប្រើជាមួយពីប៉េត (Pipette Pumper)	Set	5
15	មីក្រូពីប៉េត (Micropipette 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	5
16	មីក្រូពីប៉េតធីប (Micropipette tips 100 μ L, 200 μ L, 1000 μ L, 5000 μ L)	Set	1
17	ដបដាក់សូលុយស្យុង (Glass Bottle)	Set	5
18	ជីក្រា (កែវ) (Glass Funnel)	Set	5
19	ឧបករណ៍ប្រោះ (Funnel)	Set	5
20	ឧបករណ៍ប្រោះសូលុយស្យុងប្រើសំពាធ (Filtration unit with pump)	Set	2
21	ខ្នុរម៉ាញ៉េទិច (Magnetic Stir Bar)	Set	5
22	ដបទឹកបិត (Squeeze Bottle)	Piece	5
23	ស្លាបព្រាមន្ទីរពិសោធន៍ (Lab Spatula)	Set	5
24	កាំចិត (Knife)	Piece	5
25	កាំត្រួត (Scissors)	Piece	5
26	ដង្កៀប (Tongs)	Piece	5
27	ទែម៉ូម៉ែត្រ(អាល់កុល)(Alcohol Thermometer)	Piece	5
28	Pair ថត (Cuvette)	Box	1
29	ចង្កៀងអាល់កុល (Alcohol Burner)	Piece	5

B. Equipment

No.	Description	Unit	Quantity
1	ម៉ាស៊ីនវាស់វែងរាងភាព (Texture analyzer)	Unit	1
2	ម៉ាស៊ីនអ៊ុត្រាតូមេត្រ (Karl Fischer titrators)	Unit	2
3	ម៉ាស៊ីនរំកិល (Siever shaker)	Unit	1
4	រិហ្វ្រាក់តូម៉ែត្រ (Refractometers)	Unit	2
5	អ៊ីដ្រូម៉ែត្រ (Hydrometer)	Unit	2

6	ម៉ាស៊ីនវាស់បរិមាណអំបិល (salt meter)	Unit	2
7	ម៉ាស៊ីនវាស់ពណ៌ (Colorimeter)	Unit	1
8	pHម៉ែត្រ (pH meter)	Unit	4
9	ម៉ាស៊ីនវាស់viscosity (Viscosity Meter)	Unit	1
10	ធុញ្ជីវិភាគ (analytical balance)	Unit	2
11	ឡស្ងួត (dry oven)	Unit	1
12	ឡដុត (oven with high temperature 600 °C)	Unit	1
13	ម៉ាស៊ីនវិភាគកប្រូតេអ៊ីន (Kjedalh system)	Set	1
14	ឧបករណ៍វិហូត (rotary evaporator)	Set	2
15	ទូទឹកកក (Refrigerator)	Unit	1
16	ទូបង្កក (Freezer)	Unit	1
17	ទូរក្តាស (Chiller)	Unit	1
18	ម៉ាស៊ីនវ៉ុតិច (Votex)	Unit	5
19	ឧបករណ៍បិទទឹក (Distilled Water Machine)	Set	1
20	ឧបករណ៍កំដៅ/កូរម៉ាញ៉េទិក (Magnetic heater/stirrer)	Unit	5
21	ម៉ាស៊ីនកម្ដៅទឹក (Water bath)	Unit	1
22	ម៉ាស៊ីនកម្ដៅទឹកមានរំញ័រ (Shaking water bath)	Unit	1
23	ម៉ាស៊ីនរំញ័រដោយសំលេង (Sonicator with controlled temperature)	Unit	1
24	ម៉ាស៊ីនក្រុកទ្រុក (blender/homogenizer)	Unit	2
25	ម៉ាស៊ីនបង្វិលចាកផ្ចិត (Centrifuge)	Unit	1
26	ម៉ាស៊ីនស្ថិតិច (Spectrophotometer)	Unit	1
27	ម៉ាស៊ីនវាស់វាយភាព (Texture analyzer)	Unit	1

C. Materials

No.	Description	Unit	Quantity
1	ត្រៀមដៃ (vinyl gloves or PE gloves)	Box	1
2	ម៉ាស៊ីនមុខ (Face mask)	Box	1
3	សំណាញ់គ្របសក់ (Hairnet / hair cover)	Piece	1
4	អាវបង្ក្រាបពិសោធន៍ (Lab Coat)	Set	20
5	ស្បែកដើមបង្ក្រាបពិសោធន៍ (Safety Shoes)	Pair	20
6	រ៉ែនតាសុវត្ថិភាព (Safety Goggles)	Set	20
7	ត្រៀមដៃកំដៅ (Thermal gloves)	Pair	20
8	ត្រៀមដៃការពារ (Protective sleeve)	Pair	20
9	សម្ភារសម្រាប់ស្អាត (ក្រដាសជូត កូនកន្សែង អំបោះ ប្រដាប់ជូតកំពាល ប៉ុងលាងចាន ប្រាស់ដុសកែវ សាប៊ូលាងចាន) Cleaning Accessories (Kitchen Towel, Floor Mop, Sponge, Bottle Brush, Dish Soap)	Set	10

10	សារធាតុគីមី (Chemical Substance)	Set	1
11	ក្រដាសត្រាច្រាះ (Filter Paper)	Box	1
12	ក្រដាសធ្វើទំងន់ធាតុគីមី (Weighing Paper)	Box	1
13	ធានធ្វើទំងន់ធាតុគីមី (Weighing Bowl)	Box	1
14	ក្រដាសpH (pH Test Strips)	Box	1
15	pHស្វ័យលុយស្យុងស្តង់ដារ (pH Standard Solution)	Set	2
16	ធានបំសៅឡូនមានគំរេប (Porcelain crucible)	Set	10

D. Materials Tools and Equipment for Training

No.	Description	Unit	Quantity
1	Handouts	sets	20
2	Laptop	unit	1
3	Projector (LCD 220volt, 50/60HZ)	unit	1
4	Projection screen, portable type, big size	unit	2
5	White board, portable	unit	2
6	Laser pointer	unit	2
7	Whiteboard marker (black)	pcs	2
8	Whiteboard marker (blue)	pcs	2
9	Permanent marker (red)	pcs	2
10	Whiteboard Eraser	unit	1

Assessment Methods:

1. Demonstration with oral questioning
2. Observation
3. Interview Test
4. Written Test

LO3. Assess food products in meeting nutrient needs

Assessment Criteria:

1. Key nutrients are correctly identified addressing dietary needs / requirements
2. Correct calculations are performed to determine the quantity of nutrients in food products
3. Observations of non-compliance are properly documented using the correct record sheets
4. Appropriate recommendations to correct the identified non-compliance are proposed.

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the food groups relation to relevant diet tools
- 1.2 Relate individual dietary needs / requirement to dietary plan / food products

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

- 1.9 Identify suitable food groups and their products based on their functions, properties and characteristics for application in food development / production to meet the special nutritional needs / requirement of specific populations

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 3

A. Tools

No.	Description	Unit	Quantity
1			
2			
3			
4			

B. Equipment

LO4. Recommend diet plan/product based on dietary needs/requirements using suitable tools (e.g. nutrient databases, food composition tables, Healthy Eating Plate, etc.

Assessment Criteria:

1. Suitable tools / methods are selected for the assessment of food / nutrient needs of specific populations
2. Calculation of food / nutrient requirement based on the assessment is done correctly
3. Appropriate diet plan / products are proposed in accordance to dietary needs / requirements.

Related Knowledge, Skills, Attitude and Safety:

1. Knowledge includes the following:

- 1.1 Explain the importance of individual dietary needs / requirement
- 1.2 Describe suitable tools to assess individual dietary needs / requirement

2. Attitude includes the following:

- 2.1 Patriotism
- 2.2 Safety consciousness
- 2.3 Responsibility
- 2.4 Industriousness
- 2.5 Obedience
- 2.6 Quality consciousness
- 2.7 Teamwork
- 2.8 Patience
- 2.9 Honest

3. Skill includes the following:

4. Interpret the relevant requirements stipulated in regulations / standards / guidelines / specifications when proposing the dietary plan / food products to consumers

Methodologies:

1. Lecture
2. Demonstration
3. Self-paced instruction
4. Group activities
5. Workshop/Lab

Conditions:

Recommended list of tools, equipment, and materials for the training of 20 students/trainees for FOOD PROCESSING AND ANALYSIS Learning Outcomes 4

A. Tools

No.	Description	Unit	Quantity
1			
2			
3			
4			

B. Equipment

No.	Description	Unit	Quantity
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