Syllabus for the subject

of

AGRO PROCESSING

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

Designed in

– 2014 -

By

Government of India
Ministry of Labour & Employment
Directorate General of Employment & Training

GENERAL INFORMATION

1.	Name of the Course	:	Craft Instructor Training
2.	Duration of Instructor Training	:	1 Year (Two semesters each of six months duration including Vocational calculation and science (V.C.S) and P.O.T (Principle of Teaching).
3.	Name of the Subject	:	**Agro processing**
4.	Examination	:	AITT to be held at the end of each semester.
5.	Space Norms	:	Lab Space - **120 Sq. M** Class Room Space - **30 Sq. M** Quality lab- **40 Sq. M**
6.	Power Norms	:	10 Kw.
7.	Unit strength(Batch Size)	:	20
8.	Entry qualification	:	NTC / NAC from NCVT in Agro processing trade **OR** Diploma/Degree in Food Technology/Food Engineering /Food processing from AICTE recognized Board / University.
9.	Trainers' Qualification	**:**	Diploma or Degree in Food Technology/Food Engineering/Food processing from AICTE recognized Board / University with five / two years experience respectively.

AGRO PROCESSING		
SYLLABUS:FIRST S SEMESTER		
Weeks	**Practical**	**Theory**
1-5	Operating and handling of agro processing machinery : Hammer mill, Groundnut decorticator hand operated, Mini dal mill, Mini rice mill, Mini oil expeller, Grain cleaner, Mini grain mill, Wheat flour mill, Micro pulveriser and Destoner, Packaging machine (Heat sealing machine), Weighing Balance, Extruder. Fault identification and rectification of faults.	**Machinery in Agro processing** Different machines used in agro processing industry; working principles operation and maintenance. Maintenance of equipment.
6-8	Application of HACCP and GMP in agro processing industry. Utilization of agro industry wastes: Preparation and verification of normality of standard solutions.	**Food regulations:** Overview of Food Safety and Standards Act, 2006 BIS, ISO-22000, Agmark, HACCP, International Food Standards. International food laws and regulatory agencies: • International Organizations – FAO (Food & Agriculture Organization), WHO (World Health Organization), Codex Alimentarius, ISO, WTO. National Organizations – ICMR, ICAR, Council for social welfare, International Food Control Systems including CODEX GMP. Importance of personal Hygiene, Cleaning & Sanitary standards of Agro processing industry.
9-12	To study different storage structure for grains. Demonstration of packaging evaluations. Testing of packaging materials.	**Storage and packaging** Need and importance of storage and packaging methods, Types of packaging materials e.g. paper, glass, metal, plastic, packaging form. Quality standards for packed processed products. Packaging evaluation WVTR, GTR, Bursting strength, tensile strength, tearing strength, drop test
13-18	Cleaning, grading and other pre-processing activities. Production of whole wheat and corn flour. Detection of extraneous matter in atta/ maida. Production of Suji, Maida, Dalia. Packaging and labelling of the products. Preparation and quality evaluation of popped corn. Estimation of gluten content from wet milling of corn. Determination of dry and wet gluten content of flour. Determination of moisture content of flour using hot air oven method and IR Moisture meter. Determination of ash content of flour. Determination of water absorption power of flour. Determination of thousand kernel weight of grains. Determination of impurities present in the grains.	**Cereal grains: wheat, corn** Primary and secondary processing of wheat and corn. Types of corn. Methods of Cleaning, grading, milling. Standards for the wheat flour. Adulteration in flour.

	Determination of hectolitre weight of grains. Determination of vitreousness/ mealiness of wheat grain. Determination of pelshenke value of wheat flour. Determination of maltose figure of wheat flour. Estimation of free fatty acid of wheat flour. Determination of wheat grain hardness using texture analyzer.	
19-24	Pre-treatment in dal milling like cleaning, grading, soaking, and drying. Milling pulses for production of dal, e.g. pigeon pea, green gram, Bengal gram. Detection of khesari dal in pulses. Packaging and uses of wastes from dal mill. Effect of moisture content on the dehusking efficiency and breakage of pulses during milling. Effect of alkali treatment on the milling characteristic of pulses. Effect of wet methods of milling on the dehusking efficiency and breakage of pulses during milling. Detection of metanil yellow in pulses.	**Dal (Pulse) Milling** Classification of pulses. Pre milling treatments of pulses, pulse milling and recent developments. Principle of dal milling. Pulses suitable for milling. Different Methods of dal milling Working and principle of dal mill. By-products utilization. Adulteration in pulse.
25-26	Revision/Examination	

AGRO PROCESSING		
SYLLABUS: SECOND SEMESTER		
Weeks	**Practical**	**Theory**
1-4	Production of cereal based products like macaroni, noodles, spaghetti and vermicelli. Estimation of moisture content, protein content, ash content and fat content in cereals flour. Determination of different quality parameters in cereals product.	**Cereals industry By-Products :** Recovery and utilization of starch, gluten, dextrin, dextrose, bran, bran oil, Germ and germ oil, husk, protein isolates, high fructose corn syrup, corn liquor, yellow and white dextrin and dextrose powder.
5-10	Procurement and Pre- processing of spices, cleaning, grading, de-stoning, milling, blending and formulating and preparing of spices and spice mixes. To study the working of machinery for spice grinding. Production of spice powders from, coriander, black pepper, red chilly, turmeric etc. Detection of extraneous matter in ground spices. Detection of coal tar dies in spices containing fast natural colour like (Turmeric) Detection of papaya seeds in black pepper. Detection of powdered bran and sawdust in spices (ground). Detection of brick powder, sand dirt in chillies. Demonstrations of process of essential oil extraction and oleoresin of different spices.	**Spices and condiments Grinding** Production of major spices in India & their importance in Indian diet. Spices suitable for processing. Unit operations in spices processing: Principles, method and machinery in spice grinding. Quality assurance & methods to detect adulteration. Oleoresin of different spices.
11-18	Working of oil expellers. Effect of pre-treatment on the oil recovery from different oil seeds. Oil expelling from different oil seeds e.g. mustard, groundnut, and rapeseed, sunflower. Filtration and packaging of oil. Detection of Argemone oil. Detection of oil soluble coal tar dies in oil. Estimation of protein content in the deoiled meal. Determination of iodine value, RM value, P- value, saponification value of oils. Qualitative checking of various adulterants in oils. Solvent extraction of selected oilseeds. Physical properties of oil seeds. Preparation and sensory evaluation of peanut butter.	**Oil Extraction :** Nutritional importance and functions of oils from plant sources. Different methods of oil extractions, oil expression from oilseeds like mustard/rapeseed, coconut, sunflower, groundnut, sesame, cotton etc. Different types of oil expellers. Process flow chart of oil extractions. **Oil refining and purification :** Refining, purification, deodorization, stabilization and hydrogenation. **Different quality parameters :** Peroxide value, saponification value, Iodine value, acid value, TBA , RM value, P- value, Kries value,
19-24	Processing of paddy for rice. Packaging of rice: Weighing, bagging, Sealing machines. Grading of rice grain on the basis of shape and size. Determination of milling yield of paddy. Preparation and quality evaluation of beaten rice. Different methods of parboiling and their effects on milling of rice.	**Rice Milling** Discuss the working and principle of rice mill in detail and their parts. Suitability of paddy for rice milling. Drying of paddy for rice milling. Process of modern rice milling. Curing and ageing of rice. Working principle and operation. Cleaner, Sheller, separator, polisher, rubber roller and graders etc.

		Nutritional loss in polished rice. **Parboiling of rice:** Theory & methods of Parboiling. Advantages and limitations of parboiling of rice.
25-26	Revision/Examination	

Equipment, Machine & Tools		
Sl. No.	**Item/ Specification**	**Quantity proposed batch of 20 for a trainees**
1	Hammer mill : Power operated, 1 HP ,10 Kg/hr. Body and hopper of stainless	1 no
2	Groundnut decorticator hand operated : Hand operated 10 Kg/hr.	1 no
3	Mini dal mill : Power operated, 1 HP 10 Kg/hr. Body and hopper of stainless	1 no
4	Mini rice mill : Power operated, 1 HP 10 Kg/hr. Body and hopper of stainless	1 no
5	Mini oil expeller : Power operated, 10 HP 15 lit/hr. Body and hopper of stainless	1 no
6	Grain cleaner : Power operated, 1/2 HP;100 Kg/hr. Body and hopper of stainless	1 no
7	Mini grain mill : Power operated, 01 HP 10 Kg/hr .Body and hopper of stainless	1 no
8	**Flour Mill:** Capacity 8-9 kg , per hr. Body and hopper of stainless steel	1 no
9	Micro pulveriser : Power operated, 1 HP 25 Kg/hr	1 no
10	Storage bins of different capacity :Aluminium, 10-50 Kg Capacity with proper outlet and inlet	As per required
11	Platform scale balance : 100 Kg Capacity,	1 no

12	**Hot Air Oven:** • Should be double walled unit:- outer chamber should made up of M.S. Sheet duly painted & inner must be made up of S.S. Sheet. • Temperature should be controlled by Microprocessor Based PID Digital Temperature Indicator-cum- Controller from ambient to 390^0C with an accuracy of $\pm 3^0$C. • Air ventilators should also be provided on the sides & Air Circulation fan be a standard feature. • Supply- 220/230 Volts A. C. **Inner Size (W*D*H):** 605*605*605 mm	1 no
13	Moisture box : Aluminium, 100 g capacity cylindrical	1 no
14	De-stoner : For cleaning light materials, air classifier type	1 no
15	Packaging material : PP, PE, laminated, Stand pouches	As per required
16	Extruder : Lab scale	1 no
17	Weighing Balance (0.10 gm to 2 kg), (100 gm to 5 kg)	1 no each
18	IR Moisture meter	1 no
19	Sealing machine (For pouch and bags)	1 each
20	Pop corn making machine	1 no
21	**Muffle Furnace:** • Body Material- Should be light weight with ceramic fiber wool insulation. The outer casing should be made of double walled thick PCRC sheet, reattached with thick perforated sheet on the bottom portion, painted with attractive stove enamel. • Heating elements should be made of KANTHAL "A-1" wire and backed by high temperature ceramic wool insulation. • The temperature control- must be fitted in front of furnace with two pilot lamps. • Power supply- 220/230 volts AC fitted with microprocessor based digital temperature indicator cum controller. • Max. Temperature 1000 ^{0}C and working temperature 900 ^{0}C. Size-(150 x 150x300)mm (WxHxD)	1 no
22	De-husker for dehusking of paddy	1 no

23	**Ball Mill:** • Electrically operated having capacity from few grams to 2 Kg. Fitted with F. H. P. motor up to 2 Kg jar and with ¼ H. P. heavy duty motor for 5 Kg jar. • Maximum speed of 80 RPM. • Jar is to be made of aluminium/S.S. • Steel balls of different sizes. • Single phase 220/230 volts A.C. supply. Capacity-2 kg.	1 no
24	**Digital Weighing Balance:** **Capacity**: 220 gm **Readability:** 0.1 mg or 0.0001 gm **Weighing Pan:** 80 mm or large, with wind draft shield. Auto Calibration should be provided with respect to temperature.	1 no

25	Texture analyzer (Instrument for determination of texture, effect of viscosity, rheology, measurement of hardness, softness and stickiness, brittleness, cutting force, shearing, consistencies and penetration force and also to function as Extensograph): Texture analyzing system of minimum 50 Kg load frame capacity, should be computer controlled through compatible window based software for finding rheological properties of food products. Software should provide complete database of family of probes and attachments and include comprehensive library of reports, help guide covering a wide range of products and tests. The software should perform following tasks: • The software should be 32 bit. • The software must have the facility to modify the distance being travelled by the probe during the test to account for the bend compensation and frame deflection. • The software must have the facility to hold then constant force applied for the duration of the test by either increasing or decreasing the test speed proportionally, differentially or integrally. • It should be possible to download the latest version of the firmware via PC through the internet. • The software must provide the fourth dimension in texture analysis i. e. Acoustic data as an integral part of the test alongside force, distance and time, the acoustic emission must be used by the instrument/software to quantify sensory crispness. • The software should have the facility to write a macro i. e. an English language programme which enables a user to do routine calculations automatically. • The software should have the facility to measure linear distance for calculating crispiness/brittleness. • The software should have feature to measure area, gradient, mean time difference, ratio, travel, count positive peak, count negative peak, dispersion, average drop of, volumic mass, force maxima and force minima. The supplier must confirm categorically how each of these parameters are calculated using the software which is offered. • The software should have feature to mark events like fracture, first peak, maximum force etc. • The software must be able to determine on powders- particles cohesion after compaction, recovery from compaction, granule surface friction, resistance to flow, resistance to compression, mixing and mixing kinetics. The instrument should be able to measure hardness, firmness, stress relaxation, chewiness, cohesiveness, elasticity, tenderness, brittleness, freshness etc. The instrument should have the facility to measure dough extensional rheology of both dough and gluten to be measured during biaxial stretching. It should be possible for the instrument to acquire the data from external devices like temperature of humidity controllers. The supplier must confirm that the necessary hardware is manufactured/supplied by them in order to record the acoustic emissions which are produce when a crisp food is broken or crushed. The supplier must confirm that the necessary hardware is manufactured/supplied by them for testing powders to apply rotational as well as compression forces simultaneously on powders. Accessories with instrument: Load cells of 50 Kg, Cylinder Probes 2 Nos., Conical Probes 1 No., Spherical Probes 1 No., Crisp fracture support rig 1 No., **Blade** set 1 No., Back extrusion rig 1 No., Forward extrusion rig 1 No., TTC spreadability	

Consumables Tools & Items		
Sl. No	**Name of Item**	**Quantity**
1.	Beaker 50, 100, 250 ml, 500 ml	12 no
2.	Conical flask 50, 100, 250 ml, 500 ml	12 no
3.	Measuring cylinder 100mI,250ml, 200 ml, 500ml,	12 no
4.	Measuring flask of assorted sizes	12 no
5.	Burrete of assorted sizes with Burrete stands	12 no
6.	Pipettes of assorted sizes	12 no
7.	Thermometer (10°c to 110°C) Digital	16Pcs
8.	Rubber Gloves	12 pair for each trainee
9.	Aprons	01 for each trainee
10.	Glass Funnels of assorted sizes	12 no
11.	Funnels 500ml. & 100ml. Separating	12 no
12.	Test Tube With Test tube stand	25 no
13.	Glass rod	10 no
14.	Gas lighter	06 no
15.	Ph meter Rod	02 no
16.	Petri dish with cover	16 no
17.	Label for labelling machine	As per required
18.	Raw materials for practical's	As per required

Furniture		
Sl. No	**Name of Item**	**Quantity**
SI. No.	**Class Room**	**Qty. for 20 trainees**
1	Instructor Chair & Table with Glass	01 no
2	Magnetic White Board	01 no
3	Display Board	01 no
4	Table for computer/printer/scanner with chair	01 Set
5	Dual Desk	10 no
SI. No.	**Workshop/Lab**	**Qty. for 20 trainees**
1	Working table with 6-3x21/2 Aluminium tops	05 no
2	Stools	20 no
3	Laboratory Table with rack (8'*2'-6"-6") and sinks	04 no
4	Racks for keeping books (glass panel)etc	01 sets
5	Trainee Locker with space for 20	01 no
6	Storage Rack for Chemicals	01 no
7	Cup Board (large)	04 no
8	First Aid Box	01 no
9	Fire Extinguisher	As per required
10	Goodrej Almirha	02 no
11	Wooden Show Case For keeping & Display sample	02 no
12	White Board	01 no

- Raw material, Testing chemicals & equipments and consumables are not included in the list.
- All machines with Annual AMC.
- Proper facility for removal of waste water used for cleaning of machines from lab.
- Proper pest control facility in lab.