Curriculum for

Certificate Programme in

FOOD PROCESSING

For
Maharaja Ranjit Singh Punjab Technical University,
Bathinda (Punjab)

Prepared By:

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FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However, best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
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PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

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Coordinator

SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Food Processing Industries
2.	Name of the Certificate Programme	:	Food Processing
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III
8.	Ratio between theory and Practice	:	20 : 80 (Approx.)

2. JOB ROLE AND JOB OPPORTUNITIES

The Indian food industry is poised for huge growth, increasing its contribution to world food trade every year. In India, the food sector has emerged as a high-growth and high-profit sector due to its immense potential for value addition, particularly within the food processing industry. Accounting for about 32 per cent of the country's total food market, the Government of India has been instrumental in the growth and development of the food processing industry. The government through the Ministry of Food Processing Industries (MoFPI) is making all efforts to encourage investments in the business. It has approved proposals for joint ventures (JV), foreign collaborations, industrial licenses and 100 per cent export oriented units. Availability of skilled manpower has been identified as one of the major challenges of Indian Food Processing Industry. The Ministry of Food Processing Industries (MoFPI) is working in close collaboration with Food Industry Capacity and Skill Initiative (FICSI), the Sector Skill Council (SSC) in food processing and regularly guiding and assisting it in achieving its mandate. The food processing sector in the country is mainly handled by the unorganized sectors. About, 42% of the output comes from the unorganized sector, 25% comes from the organized sector and the rest of it comes from the small scale players. The small-scale food processing sector is a major source of employment and adds value to crops by processing.

i) Job Roles

Food processing operations includes many methods that are used to add value to the raw food materials (including marine products, poultry and meat) which can be consumed by human beings or animals. Raw food materials are transformed into edible products processing and value addition. The processed food industry is divided into the following broad segments, in which the certificate holders in Food Processing have a major role to play in processing:

- Primary processed food - which includes products such as fruits and vegetables, packed milk, unbranded edible oil, milled rice, flour, tea, coffee, pulses, spices, and salt, sold in packed or non-packed forms.
- Secondary and tertiary processing (Value-added processed food) - which includes products such as processed fruits and vegetables, juices, jams, pickles, squashes, processed dairy products (ghee, paneer, cheese, and butter), processed meat, fish and poultry, and processed marine products, confectionary, chocolates, and alcoholic beverages.

ii) Job Opportunities

On successful completion of this course, students should be able to find gainful job opportunities in the industries like those listed below besides exploring possibilities of being an entrepreneur and be self-employed. The list given below is only indicative and not comprehensive.

(a) Wage employment

- Fruit and vegetable processing
- Bakery and confectionery
- Dairy
- Meat, fish and poultry
- Grain milling

- Quality control
- Educational institutions
- KVIC etc

(b) Self-employment

- Fruit and vegetable processing
- Bakery and confectionery
- Dairy
- Milling of grains and spices
- Snacks
- Service units to larger industry/ ancillary units etc.

3. LEARNING OUTCOMES OF THE PROGRAMME

After successful completion of this programme, the students will be able to:

- Prepare different bakery products as per standards, analyse their quality, troubleshoot defects in them.
- Prepare different meat, fish and poultry products hygienically, analyse their quality and troubleshoot defects in them.
- Prepare different fruits and vegetable products hygienically, analyse their quality and troubleshoot defects in them.
- Prepare different types of milk and milk products hygienically, analyse their quality.

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN FOOD PROCESSING

FIRST SEMESTER

CODE	UNITS	STUDY SCHEME Total Hours		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
CFOT1-101	*Communication Skills	8	-	1	25	-	25	25	1	-	-	25	50
CFOT1-101P	*Communication Skills Lab.	-	24	1	-	50	50	-	-	75	3	75	125
CFOT1-102	Bakery Products	32	-	2	25	-	25	50	2			50	75
CFOT1-102P	Bakery Products Lab.	-	256	8	-	100	100	-	-	100	4	100	200
CFOT1-103	Meat, Fish and Poultry Products	32	-	2	25	-	25	25	1	-	-	25	50
CFOT1-103P	Meat, Fish and Poultry Products Lab.	-	160	5	-	100	100	-	-	100	4	100	200
CFOT1-104P	#Student Centred Activities (SCA)	-	48	2	-	25	25	-	-	-	-	-	25
CFOT1-105P	+4 Weeks Industrial Training (during vacation)	-	-	4	-	-	-	-	-	100	4	100	100
Total		**72**	**488**	**25**	**75**	**275**	**350**	**100**	**-**	**375**	**-**	**475**	**825**

* Common with other certificate programmes

\# SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

\+ **Industrial Training**

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per Semester = 16 Total working days per week = 5 Total hours per day = 7

Total hours in a Semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

CODE	UNITS	STUDY SCHEME Total Hours		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
CFOT1-206	*Basic Sciences	48	-	3	25	-	25	50	2	-	-	50	75
CFOT1-207	Fruits and Vegetable Processing	32	-	2	25	-	25	50	2	-	-	50	75
CFOT1-207P	Fruits and Vegetable Processing Lab.	-	192	6	-	100	100	-	-	100	4	100	200
CFOT1-208	Milk and Milk Products	32	-	2	25	-	25	50	2	-	-	50	75
CFOT1-208P	Milk and Milk Products Lab.	-	160	5	-	100	100	-	-	100	4	100	200
CFOT1-209P	Project Work	-	48	2	-	50	50	-	-	75	2	75	125
CFOT1-210P	#Student Centred Activities (SCA)	-	48	2	-	25	25	-	-	-	-	-	25
CFOT1-211P	+4 Weeks Industrial Training	-	-	4	-	-	-	-	-	100	4	100	100
Total		**112**	**448**	**26**	**75**	**275**	**350**	**150**	**-**	**375**	**-**	**525**	**875**

* Common with other certificate programmes

\# SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

\+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)

ii. 5 Marks for attendance as per following:
(by the trainers of the department)

a)	75%	Nil
b)	75 - 80%	2 Marks
c)	80 - 85%	3 Marks
d)	Above 85%	5 Marks

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a)	15	-	National Level participation or inter-University competition
b)	10	-	Participation in two of above activities
c)	5	-	Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1
SUBJECT CODE: CFOT1-101
COMMUNICATION SKILLS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Speak confidently.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Respond to telephone calls effectively.

Practical (24 Hours)	**Theory (08 Hours)**
	Basics of Communication • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication (1 hour)
• Looking up words in a dictionary (meaning and pronunciation) (2 hours)	Functional Grammar and Vocabulary • Parts of speech • Tenses • Correction of incorrect sentences (2 hours)
• Self and peer introduction • Greetings for different occasions (1 hour)	Listening • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking • Importance • Methods to improve speaking • Manners and etiquettes (2 hours)
• Newspaper reading (1 hour)	Reading • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading (1 hour)
• Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours)	Functional Vocabulary - One-word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases (2 hours)

• Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours)	
• Write a short technical report • Letter writing (3 hours)	
• Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours)	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT – 1.2
SUBJECT CODE: CFOT1-102
BAKERY PRODUCTS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Mill different types of wheat in different types of mills
- Prepare different bakery products
- Analyze the quality of different bakery products
- Perform CIP, COP and maintenance of utensils, equipment and machines associated with bakery industry
- Package and store processed bakery products appropriately
- Identify and troubleshoot defects/spoilage in prepared/stored products

Practical (256 Hours)	**Theory (32 Hours)**
• Identification of different food products and their names in Hindi/ Punjabi and English • Identifications of different food additives (preservatives, emulsifiers, thickeners, colours, flavours, sweeteners, etc.) used in food processing • Practice of general rules of safety, occupational health, personal hygiene and sanitation • Demonstration and perform cleanliness and maintenance exercises of workstation, equipment and instruments (6 hrs)	• Introduction to food processing • Importance of food processing • Historical development of food industry • Food Industry Scenario - Global, Indian and North Indian • Importance and sources of nutrients (Carbohydrates, Proteins, Fats, Vitamins and Minerals) • General methods and principles of food processing and preservation • Significance and general rules of safety, occupational health, personal hygiene and sanitation • Significance of cleanliness (Clean In Place-CIP and Clean Out of Place -COP) and maintenance of workstation, equipment and instruments (4 hrs)
• Determination of physical characteristics of wheat (hardness, softness) • Milling of wheat by different methods • Estimation of flour quality (moisture, ash, fat, protein, carbohydrates) • Estimation of gluten content • Determination of water absorption power of flour (40 hrs)	• Different types of Indian wheat, structure and composition of wheat • Wheat milling by roller mill (break system and reduction system) • Types of flour • Suitability of flours for different bakery products • Importance of gluten in bakery products (8 hrs)
• Identification of bakery equipment • Bread making by straight dough and sponge dough method. • Bun making (Fruit bun) • Preparation of bread rolls (soft and hard) • Preparation of bread sticks • Preparation of French bread • Preparation of two different variants of bread	• Role of raw materials used in bakery industry (water, flour, leavening agents, salt, sugar, shortening and their standards) • Theory of bread making • Different methods for making bread (straight dough, sponge dough method) • Bread faults and remedies • Quality parameters of bread

• Quality evaluation of bread (loaf volume, softness/hardness, crumb structure) • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (68 hrs)	(8 hrs)
• Preparation of biscuit making (plain, nut, melting moments, chocolate, ginger) • Preparation of cookies • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (36 hrs)	• Theory of biscuit making • Types of biscuits • Defects in biscuits and their remedial actions (4 hrs)
• Preparation of Khatai • Quality evaluation of biscuits (color, spread factor, hardness/softness) • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (30 hrs)	
• Preparation of cake (basic sponge, plain cakes, fruit cake, icing of cake) • Preparation of pastry	• Theory of cake and pastry making • Types of cakes • Cake faults and their remedies

• Preparation of pasta • Quality evaluation of pasta (moisture, hardness of raw and cooked pasta) • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/stored products (36 hrs)	• Theory of icing • Different shapes of pasta (2 hrs)
• Preparation of noodles • Quality evaluation of noodles (moisture, hardness of raw and cooked noodles) • Preparation of various puffs • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/stored products (30 hrs)	• Introduction to noodle making • Types of noodles • Puff pastry (4 hrs)
• Visit to different bakery industries • Virtual tour of different bakery industries using audio-visual aids (relevant movies, documentaries, etc.) (10 hrs)	• Etiquettes, professional ethics and discipline during visits to different industries • Tips on tour report writing and flow diagram preparation of the industry as well as individual products (2 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

UNIT – 1.3
SUBJECT CODE: CFOT1-103
MEAT, FISH AND POULTRY PRODUCTS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Identify different animals for meat production and different cuts of meat
- Prepare different meat, fish and poultry products
- Analyse the quality of meat, fish and poultry products
- Perform CIP, COP and maintenance of utensils, equipment and machines associated with meat, fish and poultry processing
- Package and store processed meat, fish and poultry products appropriately
- Identify and troubleshoot defects/spoilage in prepared/ stored products

Practical (160 Hours)	**Theory (32 Hours)**
• Identification of different animals for meat production and different cuts of meat. • Visit to slaughter houses • Ante-mortem and post-mortem examination and judgment of animal/slaughtered animal • Quality evaluation of meat (15 hrs)	• Introduction: scope and development of meat, fish and poultry Industries in India. • Importance of hygiene and sanitation during inspection, handling, slaughtering, preparation of the egg, poultry, meat and fish products • Common terms used in meat industry (6 hrs)
• Carcass cutting • Estimation and determination of pH of meat. • Product formulation. • Preparation of meat based convenience food (meat balls, patties, meat loaf) • Preparation of cured meat. • Preparation of different type of sausages (semi cooked, cooked) • Preparation of canned meat. • Preparation of meat pickles • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (Symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (35 hrs)	• Introduction to meat and different types of meat products • Composition and nutritive value of muscle • Different types of slaughtering methods for different meat animals • Factors affecting the quality of meat • Abattoir – definition and construction; basic preparatory procedures (communation, emulsification, pre-blending) (6 hrs)
• Evaluation of carcass quality of poultry. • Preparation of ready to cook poultry • Retail cuts of dressed chicken	• Introduction to poultry processing • Inspection of poultry birds • Composition and nutritive value of

• Preparation of tandoori chicken • Preparation of chicken sausage. • preparation of chicken patties. • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (Symptoms, causes and changes to make) of defects/spoilage in prepared/stored products (35 hrs)	poultry meat, • Pre-slaughter care, handling, factors affecting the quality, dressing of a poultry bird and Indian Standards of dressed chicken • Preservation of poultry meat by Chilling, Freezing, Curing, Smoking, Dehydration, Canning and Radiation (6 hrs)
• Candling and grading of eggs (Indian and US grading) • Measurement of air cells of egg. • Determination of Haugh's unit. • Formation of Iron sulphide in cooked eggs • Calculation of shape and size index of egg. • Determination of specific gravity of eggs • Preservation of whole egg (egg cleaning, cold storage, oil Treatment, cold storage, thermo stabilization, immersion in liquids). • Preparation of egg pickle. • Preparation of egg powder • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (Symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (30 hrs)	• Introduction to egg and egg products • structure, chemical composition and nutritive value • Spoilage of eggs and preservation by different methods • Packaging of whole egg. (4 hrs)
• Judging the freshness of fish • Grading of Fish • Filtering & staking of fish • Salting of fish by different methods. • Preparation of fish pickle. • Cooking of fish by different methods	• Fish and fish Products • Types of fish, composition and nutritive value • Different preservation and cooking methods for fish and processed fish products (4 hrs)

• Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (Symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (30 hrs)	
• Visit to industries for demonstration of by-products and waste disposal (5 hrs)	• Safety standards in meat industry • By-products of meat, fish, poultry and egg industry (4 hrs)
• Visit to different meat, fish and poultry processing industries • Virtual tour of different meat, fish and poultry processing industries using audio-visual aids (relevant movies, documentaries, etc.) (10 hrs)	• Etiquettes, professional ethics and discipline during visits to different industries • Tips on tour report writing and flow diagram preparation of the industry as well as individual products in the industry (2 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

SUBJECT CODE: CFOT1-105
INDUSTRIAL TRAINING – I (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through firsthand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one-year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

a) Punctuality and regularity 20%
b) Industrial training report 50%
c) Presentation and viva-voce 30%

UNIT – 2.1
SUBJECT CODE: CFOT1-206
BASIC SCIENCES

LEARNING OUTCOMES:
After undergoing this unit, the students will be able to:

- Apply the basic principles of maths in solving the basic problems of the trade.
- Apply the basic principles of physics in solving the basic problems of the trade.

Practical	Theory (48 Hours)
	Mathematics • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)

	Physics • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours) • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT – 2.2
SUBJECT CODE: CFOT1-207
FRUITS AND VEGETABLE PROCESSING

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Identify and use different fruits and vegetables and additives for making different products
- Prepare different fruits and vegetable products at cottage/small scale industrial level
- Perform CIP, COP and maintenance of utensils, equipment and machines associated with fruits and vegetable processing
- Package and store processed fruits and vegetable appropriately
- Identify and troubleshoot defects/spoilage in prepared/stored products

Practical (192 Hours)	**Theory (32 Hours)**
• Identification of different fruits and vegetables and their names in Hindi/ Punjabi and English • Identification of different food additives (preservatives, emulsifiers, thickeners, colours, flavours, sweeteners, etc.) used in fruits and vegetable processing • Identification and working of different fruits and vegetables processing utensils (kettles, ladles, measuring cups, etc.), instruments (refractometer, hydrometer, pH meter, vacuum gauge, seam checking gauge, digital balance, thermometer, etc.) and machines (sorter, grader, washers, peelers, cutters, homogeniser, corking, sealing machines, etc.). • Practice of general rules of safety, occupational health, personal hygiene and sanitation • Cleanliness and maintenance of workstation, equipment and instruments (40 hrs)	• Introduction and importance of fruits & vegetable processing • Historical development of fruits & vegetable processing and preservation industries • Fruits and vegetable Industry scenario- Global, Indian and North Indian • General methods and principles of preservation (4 hrs)
• Preparation of Jam, Jelly and Marmalade • Preparation of Preserves (Murraba) • Preparation of different chutneys and pickles • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored	• Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the preparation of products undertaken • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of India)/ CAC (Codex Alimentarius Commission) • Batch wise formulation • Yield calculation • Quality evaluation and sensory analysis of products

products (32 hrs)	• Nutritional benefits and nutritional changes during fruits and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material • Waste utilisation • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (4 hrs)
• Preparation of different wines • Preparation of vinegar • Preparation of fruit leather (mango, etc.) • Preparation of fruit candy, fruit toffees, fruit cheese and fruit bars • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/spoilage in prepared/stored products (30 hrs)	• Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the preparation of products undertaken • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of India)/ CAC (Codex Alimentarius Commission) • Batch wise formulation • Yield calculation • Quality evaluation and sensory analysis of products • Nutritional benefits and nutritional changes during fruits and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material • Waste utilisation • Introduction to troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (4 hrs)
• Preparation of ketchup, sauces, puree and pastes • Preparation of frozen fruits and vegetables • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material	• Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the preparation of products undertaken • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of India)/ CAC (Codex Alimentarius Commission) • Batch wise formulation

• Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (30 hours)	• Yield calculation • Quality evaluation and sensory analysis of products • Nutritional benefits and nutritional changes during fruit and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material • Waste utilisation • Introduction to troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (6 hrs)
• Preparation of RTS (Ready to Serve) beverages (Juices), Squashes, Syrups, Fruit Cocktail Syrup, Crushes, Nectars and fruit based carbonated beverages • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (30 hrs)	• Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the preparation of products undertaken • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of India)/ CAC (Codex Alimentarius Commission) • Batch wise formulation • Yield calculation • Quality evaluation and sensory analysis of products • Nutritional benefits and nutritional changes during fruits and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material • Waste utilisation • Introduction to troubleshooting (Symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (6 hrs)
• Preparation of Ready to Eat (RTE) chips • Preparation of different dehydrated and dried fruits and vegetable products • Canning of fruits and vegetables • Cut out analysis of canned food products • Preparation of different fruits and vegetable powders • Practice of CIP (Clean in Place) and	• Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the preparation of products undertaken • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of

COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (20 hrs)	India)/ CAC (Codex Alimentarius Commission) • Batch wise formulation • Yield calculation • Quality evaluation and sensory analysis of products • Nutritional benefits and nutritional changes during fruits and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material • Waste utilisation • Introduction to troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products (5 hrs)
• Visit to different fruits and vegetable processing industries • Virtual tour of different fruits and vegetable processing industries using audio-visual aids (relevant movies, Documentaries, etc.) (10 hrs)	• Introduction to etiquettes, professional ethics and discipline during visits to different industries • Tips on tour report writing and flow diagram preparation of the industry as well as individual products in the industry. (2 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

UNIT – 2.3
SUBJECT CODE: CFOT1-208
MILK AND MILK PRODUCTS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Identify different types of milk and milk products
- Prepare different milk products
- Analyse the quality of different types of milk and milk products
- Perform CIP, COP and maintenance of utensils, equipment and machines associated with types of milk and milk products in the industry
- Package and store processed different types of milk and milk products appropriately
- Identify and troubleshoot defects/spoilage in prepared/stored products

Practical (160 Hours)	**Theory (32 Hours)**
• Identification of machines, glassware, and utensils in dairy industries • Cleaning of utensils, glassware used in dairy industry and their handling • Practice of pipeting and measurement of sample (6 hrs)	• Introduction: status and scope of dairy industries in India • White revolution • Opportunities of employment • Importance of hygiene and sanitation from milking to milk and milk products handling (4 hrs)
• Sampling of milk • Perform physical examination of milk. • Perform platform tests of milk (organoleptic test, clot on boiling test, alcohol test, and acidity) • Estimation of fat by Gerber method • Estimation of specific gravity of milk (14 hrs)	• Milk definition, types of milk, composition, physico-chemical properties of milk. Nutritive value of milk. • Collection of milk • Principles and methods used for milk processing. • Study of working of equipment used i.e. homogenizer, pasteurizer, cream separator, deep freezer, softy making machine, ice-cream, freezer, jacketed kettles etc. (6 hrs)
• Estimation of SNF content of milk • Detection of various adulterants in milk. • Microbiological quality testing of milk by (MBRT, SPC) • Milk standardization by Pearson square method (16 hrs)	
• Perform homogenization of milk • Perform batch, flash, and continuous pasteurization. • Maintenance, cleaning of equipments and their handling • Corrective and preventive action for safe operation (12 hrs)	• Standards for milk and milk products. (4 hrs)

• Preparation of different types of milk (Standard milk, toned milk, double toned milk, flavored milk, condensed milk) • Practical demonstration on filling and sealing machine (20 hrs)	
• Identification of different parts of cream separator and it's working. • Preparation of cream • Testing of fat, SNF and acidity • Storage of cream and shelf life study. • Identification of butter churner, its parts, cleaning and handling • Preparation of butter • Testing of butter fat. • Estimation of overrun in butter cost calculation. • Estimation of fat, SNF and acidity in butter milk. • Utilization and preparation of different types of butter milk. • Demonstration of kettles, handling and safety during preparation. • Preparation of ghee and its quality analysis (moisture, ghee residue,) • Preparation of different products from ghee residue i.e. Pinni, Sweets, and use as filler (32 hrs)	• Cream: composition, types of cream, and their production methods, effects of temperature in cream production, • Butter: composition, theory of churning, production methods, and defects • Ghee: composition, different methods of production, and defects • Preparation of coagulated/fermented products. • Basics of fermentation and coagulation. (6 hrs)
• Preparation of: - Paneer - Channa - Channa based product - Processed cheese - Mawa/khoa - Dahi - Srikhand - Different sweets - Khoa • Determination of lactose in whey. • Preparation of whey Ready to Serve (RTS) • Preparation of whey powder. • Study of packing material for above products (30 hrs)	• Preparation methods, compositions and classification of following: - Paneer - Channa - Processed cheese - Mawa/khoa - Dahi - Srikhand - Different sweets (4 hrs)
• Demonstration of ice-cream freezer, its parts, working, cleaning and handling • Preparation of Ice-cream, softy, kulfi.	• Frozen products: • Ice-cream: definition, composition, role of ingredients used, technology and

• Demonstration of spray, drum driers and its parts and handling. • Determination of Moisture, fat, SNF of dried product. • Determination of solubility index • Reconstitution of skim milk • Determination of overrun in ice-creams (20 hrs)	principles, methods of production and prevention of defects in ice-cream. • Kulfi and softy: Composition and method of production • Dry milk products • Types of milk powder, baby foods and their composition, principles of drying (drum drying, spray drying and defects) (6 hrs)
• Visit to different milk processing industries • Virtual tour of different milk processing industries using audio-visual aids (Relevant movies, Documentaries, etc.) (10 hrs)	• Introduction to etiquettes, professional ethics and discipline during visits to different industries • Tips on tour report writing and flow diagram preparation of the industry as well as individual products in the industry (2 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

UNIT – 2.4
SUBJECT CODE: CFOT1-209
PROJECT WORK (48 Hours)

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Implement the theoretical and practical knowledge and skills gained through various units into an application suitable for a real practical working environment, preferably in an industrial environment.
- Explain the working of industrial environment and its work ethics.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge and skills, as required.
- Work in collaboration and prepares project report.
  Troubleshoot of hardware and software problems.

Project work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through various units in a solution of particular problem or by undertaking a project. The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students.

For this purpose, students should be asked to identify a project execute the same. It is also essential that the trainer/instructor/faculty of the trade conducts a brainstorming session to identify suitable project assignments for the students.

The project assignment can be individual assignment or a group assignment. There should not be more than 3 students, if the project work is given to a group.

The students should identify themselves or accept the given project assignment at least two to three months in advance. The project work identified in collaboration with industry should be preferred. Trainer/instructor/faculty is expected to guide the project work of all the students.

The project assignments may consist of preparation of at least 7 unique products choosing at least one from the following categories:

- Bakery
- Meat
- Fish
- Eggs
- Fruits
- Vegetable
- Milk

The following organizations may be considered for arranging the project based professional training:

- Bakeries
- Meat, Fish, and Poultry products industries
- Fruits and Vegetables products industries
- Dairy and Milk product industries

Means of Assessment

- Viva-voce
- Report writing
- Presentation

SUBJECT CODE: CFOT1-210
INDUSTRIAL TRAINING – II (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through firsthand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one-year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

a) Punctuality and regularity 20%
b) Industrial training report 50%
c) Presentation and viva-voce 30%

7. RESOURCE REQUIREMENTS

7.1 LIST OF TOOLS/EQUIPMENT

Sr. No.	Description	Quantity
1.	Rolling Pin 12"	2 Nos.
2.	Table Spoons	20 Nos.
3.	Tea Spoons	20 Nos.
4.	Forks	20 Nos.
5.	Cutting Knives	2 Nos.
6.	Wooden Spoons	10 Nos.
7.	Rolling Pins 22"	2 Nos.
8.	Sandwich Pins 7"	2 Nos.
9.	Cake Pan	2 Nos.
10.	Pastry Cutters	2 Nos.
11.	Measuring Jug	2 Nos.
12.	Palette Knives	2 Nos.
13.	Egg Beater	2 Nos.
14.	Cup Enamel or Glass	2 Nos.
15.	Swiss Roll Tins	2 Nos.
16.	Petty Tins in Sheet of Six	2 Nos.
17.	Small Flan Tins	2 Nos.
18.	Large Flan Tins	2 Nos.
19.	Enanel Bowls (5 Pins)	2 Nos.
20.	Degachis (Small)(Stainless Steel)	2 Nos.
21.	Flour Sieves 7"	6 Nos.
22.	Rubbish Bowl (Basin)	1 No.
23.	Measuring Spoons	1 Set
24.	Cake Tins 6"Loose Bottom	2 Nos.
25.	Trays for Ingredients	2 Nos.
26.	Graters	6 Nos.
27.	Lime Squeezer	2 Nos.
28.	Small Scale	1 No.
29.	Large Scale	1 No.
30.	Palette Knife 18" Blade for Icing	1 No.
31.	Large Cutting Knives	2 Nos.
32.	Biscuit cutter	24 Nos.
33.	Boat Tins	8 Nos.
34.	Madeline Tins	12 Nos.
35.	Icing Gun	3 Nos.
36.	Cream Horn Tins	2 Nos.
37.	Large Egg Beater(wire stings)	4 Nos.
38.	Moulds and Nozzles with star Shape	6 Nos.
39.	Moulds and Nozzles for Royal Icing Roses	2 Nos.
40.	All Types of Nozzles with star shape	6 Nos.
41.	Scissors	1 No.
42.	Tin Opener	1 No.
43.	Pastry Brushes (Different Sizes)	6 Nos.
44.	Piping Bags	6 Nos.

45.	Scoopers	6 Nos.
46.	Pastry Tongs	6 Nos.
47.	Cake cotters	2 Nos.
48.	Strip cutters	6 Nos.
49.	Turn Tables	3 Nos.
50.	Thermometers	3 Nos.
51.	Set of Cake Tins: - • 3' loose Bottom • 6 "Loose Bottom • 8 "Loose Bottom • 10" Loose Bottom • 12" Loose Bottom	1 Set
52.	Bread Tins	100 Nos.
53.	Slab Cake Tins: - • 15 x 11 • 10x 10 • 9 x 7 • 11 x9	2 each
54.	Peelers	2 Nos.
55.	Large Enamel-Bowl s	2 Nos.
56.	Large Sugar Sieve	1 No.
57.	Large Flour Sieve	1 No.
58.	Small Nut Grinder	1 No.
59.	Vacuum Gauge for checking of vacuum of can	01 No.
60.	Pressure Gauge or checking of pressure of can	01 No.
61.	Refracto-meter (Pocket) 0-32, 28-62, 58-92^0 B Sugar Scale	02 Nos.
62.	Brine meter (Salincimeter)	02 Nos.
63.	Hydrometers of different ranges 0-30, 30-60, 60-90, Brixhydrometer	01 Nos.
64.	pH Meter	01 No.
65.	Working table with 6-3x21/2 Aluminum tops	2+2 Nos.
66.	Fruit Trays	6+2 Nos.
67.	Enamel mugs	8 Nos.
68.	Enamel bowls	8 Nos.
69.	Pulper Electric 1/4 Tonne capacity per 8 hrs with 1 HP Motor and two S.S: Seives (1/16 mesh. 1/32 mesh)	01 No.
70.	Thermometer upto 300°C	06 Nos.
71.	Pressure Cooker	02 Nos.
72.	Sealing Machine plastic	01 No.
73.	Vegetable grader	01 No.
74.	Sandashi (Tongs)	01 No.
75.	Perforated spoons S.S.12" length 4" dia	06 Nos.
76.	Slicing Machine/slicer electrically operated	01 No.
77.	Coring knives	06 Nos.
78.	Pitting knives	06 Nos.
79.	Cutting knives	06 Nos.
80.	Juice Extractor (Screw type) 1 HP motor	01 No.

81.	Lime Juice Extractor & orange juice halving & Burring	01 No.
82.	Bottle filling machine-Electrically operated with 1 HP motor	01 No.
83.	Crown corking machine hand operated	01 No.
84.	Pilfer proof capping machine	01 No.
85.	Platform Weighing balance (digital) 20 Kg.	04 Nos.
86.	Stainless steel knives	6 pcs +16 pcs
87.	Spoons of assorted large size	16 pcs
88.	Stainless steel degdhes	6 pcs
89.	Can and cork opener	6 pcs
90.	Jelemeters	6 Nos.
91.	Jelly Filter bags	4 Nos.
92.	Glass Funnels of assorted sizes	12 Nos.
93.	Enamelled trays of assorted sizes	16 Nos.
94.	Enamelled buckets or stainless buckets	06 Nos.
95.	Gas burner with cylinder.	06 Nos.
96.	Aluminium container 50 litres capacity	2+2 Nos.
97.	2 Industrial burner with cylinders	2 Nos.
98.	4 Double burners with cylinders	2 Nos.
99.	Electric Mixer	1 No.
100.	Spoons, Wooden Ladles	16 Nos.
101.	Cooking range electric	01 No.
102.	Rubber Gloves	12 pair for each trainee
103.	Approns	01 for each trainee
104.	Refrigerator 310 Ltr.	01 No.
105.	Food Processor	02 Nos.
106.	Vegetable Cutter	01 No.
107.	Potato Peeler	01 No.
108.	Tray dryer	01 No.
109.	Fruit mill	01 No.
110.	Auto claves 20 lit cap	02 Nos.
111.	S.S.Vessels with ids 10 lit cap.	05 Nos.
112.	S.S. Vessels with lids 5 lit cap.	05 Nos.
113.	S.S.Vessels with lids 2 lit cap.	10 Nos.
114.	Wooden Basket press (For pineapple juice extraction) 10 kgs capacity	01 No.
115.	Kipps Apparatus	03 Nos.
116.	Seperating Funnels 500m1 & 100m1.	12 Nos.
117.	Test Tube – 25 ml, 50 ml	100 each
118.	Micrometer Seam Checking guage'	01 No.
119.	Water Bath	02 Nos.
120.	Retorts	01 No.
121.	Food Processor	01 No.
122.	Hot air oven	01 No.
123.	Homogenizer (two stage)	01 No.
124.	Decanter	01 No.

125.	Four door refrigerator	01 No.
126.	Meat mincer	1 No.
127.	Pulverizer	1 NO.
128.	Meat cutting knives, heavy duty Stainless steel	As required
129.	Cooking stoves	4 Nos.
130.	Water purifier	1 No.
131.	Seed germinator	1 No.
132.	Cutting machine	2 Nos.
133.	Canning unit	1 No.
134.	Heat sealing machine	1 No.
135.	Lug cap bottle sealing machine	1 No.
136.	Cabinet dryer	1 No.
137.	Pressure cookers	4 Nos.
138.	Working tables :Stainless Steel	1 No.
139.	Platform weighing balance	3 Nos.
140.	Stainless Steel Spoon of various sizes	As required
141.	Egg illumination chamber	1 No.
142.	Sausage forming machine	1 No.
143.	Mini dairy plant: Complete Mini- processing unit for milk.	1
144.	Milk Chiller : For chilling milk up to a temperature of about –10 °C	1
145.	Milk cans : Made of steel/ Aluminium, 40 lit capacity	2
146.	Cream separator : Motor operated, Centrifugal, capacity up to 1-2 Kg/ cream per min.	2
147.	Cheese vat : Made of heavy Stainless steel (306), size approx. 4’X 2.5’X 1’ with proper outlet and taps	1
148.	Plate pasteurizer (Lab model)	1
149.	Butter churner	1
150.	Boiler (Lab scale)/Baby Electric Boiler	1
151.	Deep fridge	1
152.	Steam jacketed kettle with scrapper	1
153.	Mawa making machine	1
154.	Crown corking machine	5
155.	Ice cream plant	1
156.	Garber Centrifuge : For Fat estimation in milk,	4
157.	Milk Butyrometer for fat estimation	100
158.	Electric oven/Hot air oven	4
159.	Desicator (Glass)	5
160.	Weighing balance Digital (min 0.1 gm to max 5 kg)	2
161.	Steam Jacketed Kettle	1
162.	Can body reformer and can flanger	1
163.	Can seamer	1
164.	Exhaust box.	1
165.	Cup sealer	1
166.	Vernier caliper : 15 cm. 0.01 mm LC	2

167.	Screw Gauge : Micrometer, 0.001 mm LC,10 cm cap	4
168.	Steel scale : 12 " standard steel	2
169.	Steel Measuring tape : Scales 1 meter, and of 50 ft.	2
170.	Weight balances Digital(min 0.01gm to max 1kg)	1
171.	Hot plate : Electrical 2 KW	1
172.	Spray drier (Lab Scale)	1
173.	Sealing machine : Hand / pedal operated	1
174.	Syrup tanks : 20, 50 lit capacity SS	1
175.	Pressure cooker : 5 Kg and 10 Kg SS	1
176.	Vacuum filling machine : For filling liquid in bottles, 200 ml, 500 ml, 1000 ml. Manual	As required
177.	SS filter : Sieve type cloth filter, hydraulic,	1
178.	Sugar Coating pan : SS, Revolving type with speed control	1
179.	Bottle opener : Stainless Steel	4
180.	Burette with stand : 50 ml ordinary glass	50
181.	Pipette : 0.1 to 1ml, 2ml, 5ml, 10ml, 10.75ml	As required
182.	Lab glassware's : Different sizes and types	As required
183.	Working tables : Stainless Steel Size 6' X 3'	1
184.	Improved stoves : Made of MS with proper safety measures, valves etc	1
185.	Stainless steel / Aluminium pots : Different capacities	As required
186.	Milko Tester (for fat testing of milk)	1
187.	Lactometer	20
188.	Lactometer Jar	20
189.	Solubility Index Mixer	1
190.	Solubility Index Centrifuge	1
191.	Softy Making Machine	1
192.	Butter Mould	2
193.	Butter Worker	1
194.	Beaker - 50, 100, 250 ml, 500 ml	12 Nos. each
195.	Conical flask -50, 100, 250 ml, 500 ml	12 Nos. Each
196.	Measuring cylinder 100mI, 200 ml, 500ml,	12 Nos. Each
197.	Measuring flask 250 ml	12 Nos.
198.	Burrete with stands 50 cc	50 Nos.
199.	Pipettes 25cc & 10 cc, 5 cc	20 Nos. Each
200.	Thermo motor (10°c to 110°C)	30 PCS
201.	Digital thermometer (0-250°)	04 Nos.
202.	Egg Yolk Quality Tester	01 No.
203.	Bostwick Consistometer	01 No.
204.	Microscope	01 No.
205.	Mini Milk Processing Plant	01 No.

BASIC EQUIPMENT FOR SETTING UP OF BAKERY

Sr. No.	Description	Quantity
1.	Heavy Duty Electric Oven	2 Nos.
2.	Set of Scales (Avery Big One)	2 Nos.
3.	Small Bakery Oven	2 Nos.
4.	Refrigerator	1 No.
5.	Deep Fridge	1 No.
6.	Dry Powder	1 No.
7.	Standing Shelving Racks with Trays	4 Nos.
8.	Bin Containers	4 Nos.
9.	Weighing Scale (Small)	1 No.
10.	Cup Boards	2 Nos.
11.	Wash Basins	2 Nos.
12.	Swill Bins(Big)	2 Nos.
13.	Dough Mixer with variable speed	2 Nos.
14.	Demonstration Table with Marble Top	3 Nos.
15.	Grinding Machine	1 No.
16.	Cooling Racks with Trays	1 No.
17.	Kneading Table	1 No.
18.	Stock Pots	3 Nos.
19.	Mixer grinder	2 Nos.

FURNITURE

Sr. No.	Description	Quantity
1.	Working Table with 6-3x21/2 Aluminum tops	01 No.
2.	Cup Board (large)	04 Nos.
3.	Laboratory table with rack (8'x2'-6"-6") and sinks	04 Nos.
4.	Instructor's table and chairs	1 Set
5.	Racks for keeping books etc.	01 Set
6.	Wooden show case for keeping the samples & display of the products.	02 Nos.
7.	Instructor Chair & Table	01 Nos.
8.	Dual Desk	10 Nos.
9.	White Board	01 Nos.
10.	Suitable Work tables (Wooden)	05 Nos.
11.	Stools (high)	20 Nos.
12.	Discussion Table	01 No.
13.	Tool Cabinet	01 No.
14.	Trainees Locker with space for 20	01 No.
15.	First Aid Box	01 No.
16.	Book Shelf (glass panel)	01 No.
17.	Storage rack	01 No.
18.	Book Shelf (glass panel)	1
19.	Storage rack	1

7.2 LIST OF CONSUMABLES (Quantity : As per Requirement)

1.	Wheat
2.	Maida
3.	Semolina (Suji/Rawa)
4.	All purpose flour
5.	Bread flour
6.	Protective gloves, hats, hairnets, coats, boots
7.	Sanitizers, Dishwashing Chemicals, Bleach, Chlorine
8.	Sugar
9.	Salt
10.	Bakery shortening
11.	Additives (Sugar, salt, colours etc.)
12.	Different types of pasta
13.	Cream
14.	Noodles
15.	Video camera for recording the visit
16.	Different types and varieties of fruits and vegetables
17.	Protective gloves, hats, hairnets, coats, boots
18.	Sanitizers, Dishwashing Chemicals, Bleach, Chlorine
19.	Fruits and vegetables - different types, varieties and at different levels of ripening
20.	Carbon-di-oxide gas cylinders- filled
21.	Oil
22.	Spices and condiments
23.	Different meat samples
24.	Different cuts of meat samples
25.	Carcass of big animal
26.	Woods for smoking, liquid smoke
27.	Spices and condiments
28.	Sausage casings
29.	Eggs- different varieties and colours
30.	Different types of fish
31.	Milk
32.	Rennet enzyme
33.	Different strains of Microbial Culture (Lactococcus, Lactobacillus, Streptococcus, Propionibacter, etc.) families

7.3 LIST OF RECOMMENDED BOOKS

1. Essentials of Food and Nutrition by Swaminathan Vol. I and II, Health Kalyani publishers, New Delhi
2. Hand book of Analysis of Fruits and Vegetables by S. Ranganna, Tata Me Graw- Hill. Publishing Company, New Delhi
3. Food Chemistry by FANNEMA,
4. Hand Book of Food & Nutrition by Swaminathan, Narosa Publishing House, New Delhi
5. Nutrition & Dietetics by Joshi, Tata McGraw-Hill Education, New Delhi
6. Fundamentals of Food & Nutrition by Sumati R. Mudambi, Published by New Age International (P) Ltd.,
7. Food Science by Sri Laxmi, New Age International Publishers, New Delhi
8. Foods: Facts and Principles by Shakuntala Maney
9. Food Science by NN Potter, CBS publishers, New Delhi
10. Principles of Food Science Vol. – I by Fennema, Karrel, McGraw-Hill Book Company, New York
11. Preservation of Fruits and Vegetables by Girdhari Lal, Sidhapa and Tandon, CBS Publishers, Delhi
12. Hand book of Analysis of Fruits and Vegetables by S Ranganna, Tata Me Graw- Hill. Publishing Company, New Delhi
13. Food Composition & Preservation by Bhawna Sabarwal, Commonwealth Publishers 1999, New Delhi.
14. Food Preservation by S.K. Kulshrestha, vikas publishing house Pvt. Ltd., New Delhi
15. Handling, Transportation and Storage of Fruits and Vegetables by A Lloyd, Ryall Penizer (AVI Publications)
16. Food Storage Part of a system by Sinha and Muir (AVI)
17. Drying and Storage of Grains and Oilseeds by Brooker & Hall, CBS
18. Milk and Milk Products by Eckles and Eckles, Tata McGraw-Hill Education Pvt. Limited;
19. Outlines of Dairy Technology by Sukmar De, Oxford University Press, India
20. Dairy Plant System and Layout by Tufail Ashmed, McGraw-Hill Education (India) Pvt Ltd.
21. Chemistry & Testing of Dairy Products by Atherton Newlander, John Alvin Newlander Publisher: Westport
22. Preservation of Fruits and Vegetable by Vijaya Khader; Kalyani Publication
23. Post Harvest Technology of Fruits and Vegetables – Handling, Processing, Fermentation and Waste Management y LR Verma and VK Joshi
24. Processing Fruits: Science & Technology vol 1-2 by Somogyi
25. Processing Vegetables: Science & Technology vol 1-2 by Somogyi
26. Meat Science by Lawrie, Heinemann Educational Books Ltd., London
27. Egg Science and Technology by PC Pande, Vikas Publishing House (P) Ltd, New Delhi
28. Fish Processing and Preservation by CL Cutting (Agro Botanical Publisher)
29. Poultry, Meat and Egg Products by Parkursht and Mountney (CBS Publishers)
30. Fish Processing Technology by GM Hall (Blackie Publishers)
31. Bakery Engineering and Technology, Vol. I and II by Matz; CBS
32. Bakery Products Published by SIRI
33. Cereal Technology by Kent; CBS

34. Basic Baking by SC Dubey
35. Practical Handbook of Bakery by US Wheat Associates
36. Handbook of Packaging by Paine and Paine; Morgan-Grampian Publishing Co., New York (1976).
37. Manual of Analyzing for Fruits and Vegetables Products by S Ranganna; CBS Publishers & Disttributor, New Delhi.
38. Food Analysis by Suzzane Nielsen
39. ISI Handbook of Food Analysis- (18 Volumes in 5 parts)- BIS
40. AOAC- 18th Edition- (CD ROM Edition)
41. Quality Control for the Food Industry (Vol. I and II) by Kramer and Twigg (AVI)
42. Laboratory Methods of Sensory Evaluation by Larmond
43. Sensory Analysis by Piggot
44. Hand Book of Food Analysis by S.N. Mahindru
45. The Chemical Analysis of Food and Food Products by Jacobs

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.

2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.

3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.

4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.

5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.

6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF CONTRIBUTORS/EXPERTS

a) Following experts participated in the workshop to design curriculum of certificate programme in 'Food Processing' with NSQF alignment for MRSPTU, Bathinda on 6-7 July, 2016 at NITTTR, Chandigarh.

1.	Dr. D C Saxena, Professor & Head, Deptt. of Food Engineering and Technology, Sant Longowal Institute of Engineering and Technology, Longowal-148106, District Sangrur, Punjab
2.	Dr. Kawaljit Singh Sandhu, Ch. Devi Lal University, Sirsa, Haryana
3.	Mr. Bhupinder Singh, Assistant Professor, Deptt. of Food Technology, Ch. Devi Lal State Institute of Engineering and Technology, Panniwala Mota, Sirsa, Haryana
4.	Mrs. Damandeep, Retd. Principal, Govt. Home Science College, House No. 1066, First Floor, Sector 15-B, Chandigarh
5.	Mrs. Madhu Nanda, Retd. Principal, Govt. Home Science College, House No. 578, Sector 16-D, Chandigarh
6.	Dr. Nirupa Marwaha, Professor, Deptt. of Food & Nutrition, Govt. Home Science College, Sector 10, Chandigarh 160 010
7.	Mr. Vedpal Yadav, Department of Food Technology, Govt. Polytechnic, Mandi Adampur, Hisar, Haryana
8.	Mr. Mohit Jindal, Department of Food Technology, Govt. Polytechnic, Mandi Adampur, Hisar, Haryana
9.	Mr. Vishal Kalia, Sr. Lecturer, Chandigarh Institute of Hotel Management & Catering Technology, Sector-42, Chandigarh
10	Mr. Manoj Kumar Pandey, Senior Technician, Deptt. of Food Engineering and Technology, Sant Longowal Institute of Engineering and Technology, Longowal-148106, District Sangrur, Punjab
11	Mrs. Baljit Kaur, Govt. Industrial Training Institute, Patiala, Punjab
12	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
13	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh **Coordinator**

b) Following experts participated in the workshop to design curriculum of certificate programme in 'Food Processing' with NSQF alignment for MRSPTU, Bathinda on 29 July, 2016 at NITTTR, Chandigarh.

1.	Dr. D C Saxena, Professor & Head, Deptt. of Food Engineering and Technology, Sant Longowal Institute of Engineering and Technology, Longowal-148106, District Sangrur, Punjab
2.	Mr. Vedpal Yadav, Department of Food Technology, Govt. Polytechnic, Mandi Adampur, Hisar, Haryana
3.	Mr. Mohit Jindal, Department of Food Technology, Govt. Polytechnic, Mandi Adampur, Hisar, Haryana
4.	Mr. Manoj Kumar Pandey, Senior Technician, Deptt. of Food Engineering and Technology, Sant Longowal Institute of Engineering and Technology, Longowal-148106, District Sangrur, Punjab.

c) Following experts participated in the workshop to review the curriculum of certificate programme in 'Food Processing' for MRSPTU, Bathinda on 20 January, 2017 at NITTTR, Chandigarh:

1.	Dr. MM Malhotra, Ex-Principal, TTTI, Chandigarh
2.	Shri Arvind Dixit, Advance Technology, Sector 24, Chandigarh
3.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU, Bathinda, Punjab
4.	Shri Kulmohan Singh, Ex-HOD, Electrical Engg., CCET (Diploma Wingh), Sector 26, Chandigarh
5.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
6.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
7.	Shri Pritpal Singh Aulakh, GZSCCET, Bathinda
8.	Shri Naib Singh, Sr. Technician, GZSCCET, Bathinda
9.	Shri Jagdip Singh, , Sr. Technician, GZSCCET, Bathinda
10.	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
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