MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : DIPLOMA IN FOOD TECHNOLOGY

COURSE CODE : FC

DURATION OF COURSE : 6 SEMESTERS **WITH EFFECT FROM 2014-15**

SEMESTER : FIFTH **DURATION: 20 WEEKS**

PATTERN : FULL TIME - SEMESTER **SCHEME : G**

SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									
				TH	TU	PR	PAPER HRS	TH(01)		PR(04)		OR(08)		TW(09)		SW (19500)
								MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1	Food Packaging	FPG	19517	03	--	02	03	100	40	--	--	--	--	25@	10	50
2	Industrial Dairy Technology	IDT	19518	04	--	02	03	100	40	50#	20	--	--	25@	10	
3	Fruit & Vegetable Technology	FVT	19519	04	--	04	03	100	40	50#	20	--	--	25@	10	
4	Food Plant Organization and Management	FPOM	19520	04	--	--	03	100	40	--	--	--	--	--	--	
5	Project	PRO	19081	--	--	04	--	--	--	--	--	50#	20	50@	10	
6	Entrepreneurship Development and Industrial Project	EDI	17073	01	01	--	--	--	--	--	--	--	--	25@	10	
7	Behavioural Science $	BSC	17075	01	--	02	--	--	--	--	--	25#	10	25@	10	
			TOTAL	**17**	**01**	**14**	--	**400**	--	**100**	--	**75**	--	**175**	--	**50**

Student Contact Hours Per Week: **32 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 800**

@ Internal Assessment, # External Assessment, $ – Common to All Conventional Diploma, [ ] No Theory Examination.

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work.

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : DIPLOMA IN FOOD TECHNOLOGY

COURSE CODE : FC

DURATION OF COURSE : 6 SEMESTERS **WITH EFFECT FROM 2014-15**

SEMESTER : SIXTH **DURATION: 16 WEEKS**

PATTERN : FULL TIME - SEMESTER **SCHEME : G**

SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME								
				TH	TU	PR	PAPER HRS	TH(01)		PR(04)		OR(08)		TW(09)		SW (19600)
								MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1	In plant Training	IPT	19903	--	--	--	--	--	--	--	--	100#	40	100@	40	--
	TOTAL			**--**	**--**	**--**	--	**--**	**--**	**--**	**--**	**100**	**--**	**100**	**--**	**--**

Student Contact Hours Per Week: (20 Weeks Duration)

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 200**

@ Internal Assessment, # External Assessment, $ – Common to All Conventional Diploma, [ ] No Theory Examination.

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work.

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fifth

Subject Title : Food Packaging

Subject Code : 19517

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	150

Notes:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

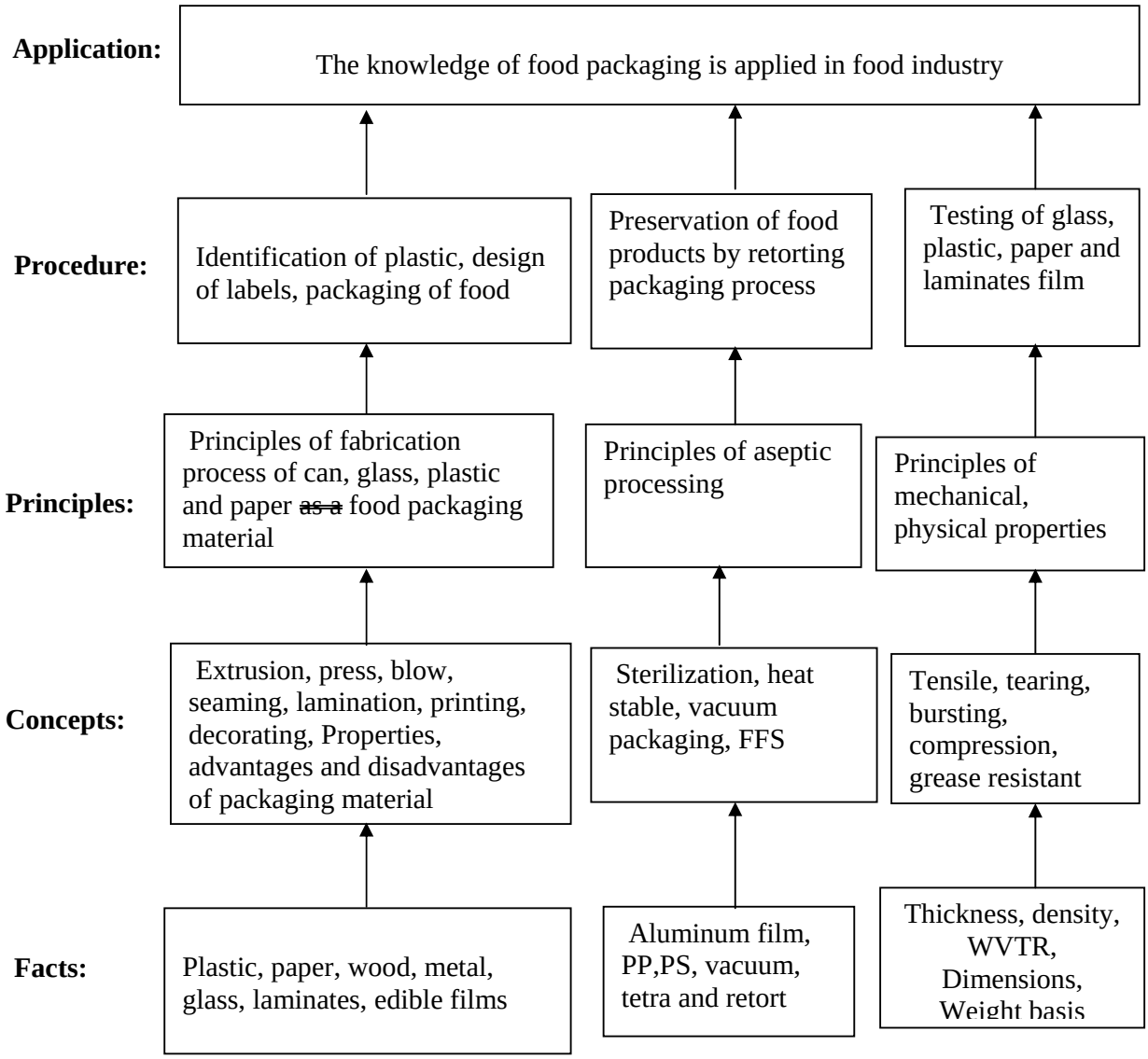
Packaging is an integral part of food processing. It performs two main functions: to advertise foods at the point of sale, and to protect foods to a pre-determined degree for the expected shelf life. In addition the package should not influence the product by migration of toxic components, by reaction between the package and the food or by the selection of harmful microorganisms in the packaged food. The food technologist is required to have the knowledge of packaging material, its function, properties, types, forms, suitability to foods, migration quality aspects and legislative aspects.

General Objectives:

Students will be able:

1. Impart comprehensive overview of the scientific and technical aspects of food packaging
2. Instill knowledge on packaging machinery, systems, testing and regulations of packaging.
3. Understand the recent development in food packaging system

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: INTRODUCTION OF PACKAGING **Specific Objectives:** ➢ State functions, importance and levels of packaging material. ➢ List Packaging material and its form. **Contents:** 1.1 Introduction: (Marks-06) • Definition, importance, scope of food packaging, functions of food packaging and requirements for effective food packaging, various level of packaging and primary elements of packaging forms 1.2 Packaging materials: (Marks-06) • Various packaging materials, e.g., aluminum, tinned steel, glass, paper, paper board, carton board, flexible films, laminates, co-extrusion and others.	06	12
Topic 2: PACKAGING MATERIALS (MANUFACTURING PROCESS) **Specific Objectives:** ➢ State advantages and limitation of packaging material. ➢ Describe manufacturing process of packaging materials ➢ List Types of plastic, paper, paper board and its properties. **Contents:** 2.1 Metal container : (Marks-06) • Can fabrication, can lacquers, types of can, advantages, disadvantages. 2.2 Glass container: (Marks-06) • Manufacturing process (Blow and blow and Press and blow), advantages and limitations, types of closures. 2.3 Plastic films : (Marks-10) • Food grade plastic films, properties and uses of PE, PP, PET, PS, PVC, PVdC, BOPP, PA etc. • manufacturing process of flexible and rigid plastic materials, injection molding, blow molding, co-extrusion and lamination process 2.4 Paper and paper boards : (Marks-08) • Types of paper, Manufacturing Process properties and uses, types of paper board, manufacturing process of corrugated board and its uses.	14	30
Topic 3: PACKAGING SYSTEMS **Specific Objectives:** ➢ Give the layers in tetra packaging system its role and process of packaging ➢ Draw flow sheet process technology of retort system, vacuum system and active packaging **Contents:** 3.1 Aseptic packaging system: (Marks-08) • Sterilization of packaging material, sterilization of product, aseptic cans system, aseptic cup system and aseptic carton	06	20

system. Aseptic FFS (Tetra Pack system) 3.2 Retort packaging system: (Marks-06) • Packaging material, properties requirement and retort packaging system 3.3 Other system: (Marks-06) • Form, fill and sealing machine (FFS), vacuum packaging, Active and Intelligent packaging systems		
Topic 4: DECORATIVE PACKAGING **Specific Objectives:** ➢ State the purpose to decorate the packaging material ➢ Draw diagram of different printing process **Contents:** • Decoration, different graphic designs and suitable printing methods.(flexography, gravure, letter press & dot matrix	06	08
Topic 5: PACKAGING MATERIAL FOR SPECIFIC FOOD PRODUCTS **Specific Objectives:** ➢ Name suitable packaging material for specific food products. ➢ List packaging material and its properties **Contents: Product and package capability** Suitable Packaging material for following food products • Liquid food and Oil • Bakery products • Confectionery products • Frozen foods • Dehydrated foods • Tea, coffee and spices • Meat and poultry • Fresh fruits and Vegetables	06	10
Topic 6: QUALITY OF PACKAGING MATERIAL **Specific Objectives:** ➢ Describe quality testing of packaging material ➢ Give formula of mechanical properties of packaging material. **Contents:** • Packaging specification and control of packaging quality, testing of packaging material • Glass bottle- (mechanical property, dimensions, internal pressure, thermal resistance) • Plastic Film – mechanical properties, WVTR, grease resistance, microbial resistance, thickness, basis weight, density etc. • Corrugated board.- mechanical properties, moisture, ply separation etc**.**	06	12
Topic 7: SHELF LIFE AND LEGISLATION **Specific Objectives:** • Describe process of detection of shelf life of packed food • Give the limits of Overall migration and packaging regulations. **Contents:** • Shelf life testing and factors affecting • Food packaging laws, migration in packed food and food labeling	04	08

as per FSSAI. • Environmental Concerns- recycling and disposal of packaging waste		
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Understand the collection of various packaging materials and observing the types of packaging materials used for particular food product.
2. Analyze the packaging material with respect to requirement.

Motor Skills:

1. Handle equipments / instruments.

List of Practicals:

1. Collection of packaging materials and Identification of various Packaging materials
2. Observe the effect of packaging material on food product (Physical weight, colour, moisture, odour etc)
3. Cut-out examination of canned food.
4. Estimation of WVTR of different plastic films.
5. Estimation of Grease resistant, Microbial resistant and Gas resistant of plastic film.
6. Testing of flexible packaging material (physical/mechanical)
7. Testing of glass container.(Dimensions, Thermal shock, Mechanical properties)
8. Testing of paper board.
9. Design the food packaging labels with graphic design of any four products basis FSSAI norms.
10. Identification of plastic films by visual methods.
11. Visit to IIP / package fabricating industry.

Learning Resources:
1. Books:

Sr. No.	Author	Title	Publisher
01	--	Packaging of Food Products	Indian Institute of Packaging, Andheri, Mumbai
02	--	Modern Food Packaging	Indian Institute of Packaging, Andheri, Mumbai
03	--	Tin plate in Packaging	Indian Institute of Packaging, Andheri, Mumbai

04	--	Aluminium in Packaging	Indian Institute of Packaging, Andheri, Mumbai
05	M.Mahadviah & R.V.Gowramma	Food Packaging Materials	Mata McGraw Hill Publishing Co., New Delhi
06	. Paine FA and Paine HY	A Handbook of Food Packaging	Blackie Academic and Professional, 1992
07	Coles R, McDowell D, Kirwan MJ	. Food Packaging Technology.	Blackwell, 2003
08	Robertson GL	Food Packaging	Principles and Practice, CRC Press Taylor and Francis Group, 2012

List of Laboratory Equipments:

Sr. No	Name of Equipment	Technical Specification	Min.Qty. /Nos. Required	Remark Make/ Model
01	Floor Top Vacuum Packaging Machine	Chamber dimensions (L1xW1xH1) (mm) 520 x 450 x 100, Seal length L2 (mm) 400, Seal width (mm)-3, Max pack size (mm) 400 x 350 Number of sealing jaws-2, Machine dimensions (LxWxH) (mm) 655 x 690 x 940 Pump capacity (LPM)-330, Weight (kg)-167	**01**	
02	Can Vaccum Tester	CAN VACCUM TESTER WITH RUBBER BUNG AND PRICKER	**01**	
03	Bottle Filling Machine	This machine is suitable for accurate filling of liquids like medicines, syrups, ketchup, solutions etc. In bottles, machine consists of two/four filling heads with vaccum pump and 1/2 H.P. motor. All contact parts are of stainless steel	**01**	
04	Hand Sealing machine	Plastic hand sealing machine for plastic bag sealing	**01**	
05	Burst Strength Test	-- a) 1/4 H.P. Single Phase 220 volts 1440 R.P.M. motor b) Fitted with large 10 cm dia (4") dial and lazy hand indicator and c) A precise and reliable machine. d) Study in construction. 1 No. Two separate gages : 1) Paper - 0 - 8 kgf/cm2 2) P/B - 0 - 40 kgf/cm2 3) Sample Loading arrangement	**01**	
06	Micro -meter screw gauge	--Micrometer minimum -0.1mm to maximum 5cm thickness measurement	**01**	

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fifth

Subject Title : Industrial Dairy Technology

Subject Code : 19518

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	50#	--	25@	175

Notes:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

The Indian Dairy Industry has made rapid progress since independence. A large number of modern milk plants and product factories have been established. These organized dairies have been successfully engaged in the routine commercial production of milk and milk products. The subject will be beneficial for students for working in dairy plant and also for establishing own dairy plant.

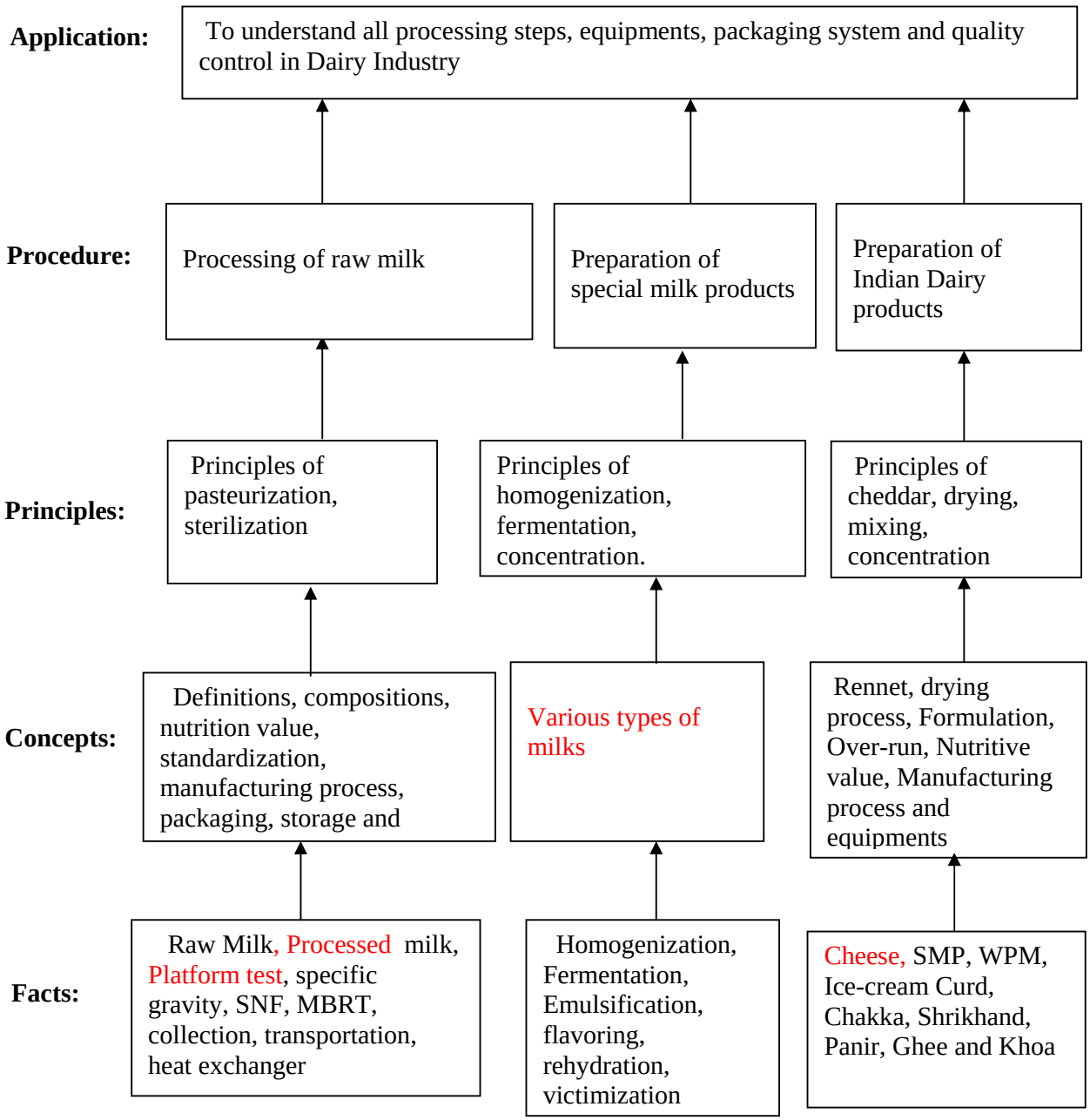
Dairy technology is an important branch of food industry involving the production of various dairy products such as cheese, evaporated milk, dried milk, dried milk products, ice cream, frozen desserts and indigenous dairy products. The food technologist is required to have the knowledge of the process technology of dairy products, types of equipments used for the processes and utilization of the byproducts of dairy industry. This subject covers major dairy products manufacturing processes and their quality standards.

General Objectives:

Students will be able to:

1. Get the knowledge of testing of milk and milk products.
2. Understand utilization of equipments and process technology of western and Indigenous milk products.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: MARKET MILK **Specific Objectives:** ➢ Describe the composition and nutritive value ➢ State the Physico-chemical properties of milk ➢ Detect of adulteration in milk **Contents:** 1.1 Introduction: (Marks-08) • Introduction, definition, the market milk industry in India and abroad, Indian standards, composition, factors affecting composition of milk, food and nutritive value. 1.2 Properties of Milk: (Marks-06) • Physico-chemical properties of milk, physico-chemical properties of milk constituents, microbiology of milk, adulteration in milk and other dairy products.	08	14
Topic 2: MILK AND PUBLIC HEALTH **Specific Objectives:** ➢ Describe procedure of milk collection and transportation ➢ Give types of milk cooling. **Contents:** • Safeguarding milk supply, clean milk production, buying and Collection of milk. • Cooling and transportation of milk, action of milk on metals.	08	10
Topic 3: PASTEURIZATION **Specific Objectives:** • State manufacturing Process of pasteurization and processing conditions • Sketch of plate heat exchanger and process **Contents:** • Pasteurization process, types, packaging and storage of pasteurized milk, distribution, cleaning and sanitation of dairy equipment. • Judging and grading of milk, flavor defects in milk, their causes and prevention, uses of milk.	10	14
Topic 4: SPECIAL MILKS **Specific Objectives:** ➢ Describe production process of different special milk by variation in treatment and value addition. • Draw process flow sheet production of various special milk **Contents:** • Manufacturing process of Sterilized milk, homogenized milk, soft curd milk, flavored milk, vitaminized / irradiated milk, frozen and concentrated milk • Manufacturing process of fermented milk, standardized milk, reconstituted / rehydrated milk, recombined milk, toned milk, double toned milk, humanized milk, miscellaneous milk.	10	20

Topic 5: CHEESE AND DEHYDRATION OF MILK **Specific Objectives:** • Describe process of cheese making and processing condition. • State composition of Cheese **Contents:** 5.1Cheese: (Marks-10) • Definition, scientific basis of cheese making, classification, composition, food and nutritive value. • Cheddar cheese, curing, freezing, yield, Distribution of milk constituents in Cheddar cheese and whey. 5.2 Dehydrated Milk: • Dehydration of milk by sprays drying and drum drying, manufacturing process of SMP and WMP. (Marks-08)	12	18
Topic 6: ICE CREAM AND FROZEN DESSERTS **Specific Objectives:** • Classify cheese and ice cream • State productions process and list quality control parameters**.** **Contents:** • Definition, classification, food and nutritive value, role of constituents, properties of mixture. Manufacture, packaging, hardening and storage, soft ice cream (softy).	08	12
Topic 7: INDIAN DAIRY PRODUCTS **Specific Objectives:** • Prepare and analyze Indian dairy products **Contents:** • Flow diagram for manufacture of kheer, khoa, khurchan, kulfi, dahi, shrikhand, panir, chhana, makkhan, ghee, lassi, ghee residue.	08	12
Total	**64**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Understand physical examination of milk.
2. Understand analysis of milk for proximate constituents.

Motor Skills:

1. Carry out the preprocessing operations in dairy industry.
2. Operate equipment and instruments.

List of Practicals:

1. Physical examination of market milk.
2. Testing of milk by MBRT and turbidity test.
3. Microbial examination of milk with special reference to coliform.
4. Analysis of milk for fat, acidity, specific gravity.
5. Preparation of Ghee and Butter
6. Preparation of flavored milk.
7. Analysis of cheese – (fat, protein, lactose, salts, Total Solids (TS), Milk Solid Not Fat (MSNF).

8. Preparation of ice cream.
9. Preparation of dahi, chakka, shrikhand, panir, kulfi, makkhan, ghee, cheese spread.
10. Preparation of soya product – soya milk, tofu.
11. Preparation of peanut butter, peanut milk

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Sukumar De	Outlines of Dairy Technology	Oxford University Press, Mumbai
02	Webb, Johnson & Alford	Fundamentals of Dairy Chemistry	EBS Publishers & Distributors, New Delhi
03	Deepak Sahai	Buffalo Milk Chemistry & Processing Technology	S. I. Publication, Haryana, India

LIST OF LABORATORY EQUIPMENTS:

Sr. N0	Name of Equipment	Technical Specification	Min.Qty./ Nos. Required	Remark Make/ Model
01	**Lactometer**	Lactometers are made from the best quality of borosilicate and neutral glass. We proffer lactometer at the most reasonable price	**01**	
02	**Milk Sampler**	Milk Sampler/Dipper made of Stainless Steel 304 grade material of 4 mm thick rod and cup made of 1.2 mm & 0.6 mm thick sheet, available in 50 ml & 100 ml capacity. Milk Sampling Dipper for Tanker made of Stainless Steel 304 grade material of 250 ml Cap	**01**	
03	**Milk Fat Analyzer**	**Measuring Parameters:** • Fat : From 0.5% to 12% with accuracy +/-0.1% • Solid non Fat(SNF) : From 6% to 12% with accuracy +/-0.2% • Added water to milk : From 0% to 60% with accuracy +/-5% • Milk Density : From 1.0260g/cm3 to1.0330 g/cm3 +/-0.0005g/cm3 • Protein : From 2% to 6% with accuracy +/-0.2% • Freezing Point : From 0C to –1.000C. • Measuring Cycle : 30 Sec. • (These parameters are optional.) • Environmental Conditions: • Ambient temperature : 15C – 45C • Milk temperature : 5C – 35C • Relative Humidity : 30% - 80% • Electrical Parameters : • AC Power supply Voltage : 220V+/-5%	**01**	

		• DC Power Supply : : 12V • Power Consumption : 100W max • Mechanical Parameters : • Dimensions (WxDxH) : 95 x 300 x 250 mm		
04	Milk Fat Testing Centrifugal	Milk Fat Testing Centrifugal Small Machine with acid resistance coating, Plexiglass cover, special motor, rapid braking, angle head with 0-5 minute timer, easily can be placed on Laboratory table for 8, 12 Tests. Nova Safety Multi purpose Centrifuges having operation for 8 & 12 Gerber Tests, 4 X 50 ml & 12x50 ml solubility index tubes. Solubility Index tube for above machine Borosilicate Glass 15 & 50 ml.	**01**	

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fifth

Subject Title : Fruit and Vegetable Technology

Subject Code : 19519

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	04	03	100	50#	--	25@	175

Notes:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Fruits and vegetables are seasonal in nature, highly perishable commodities and having shortest shelf life. Due to their nutritive and medicinal value, they make significant contribution in our diet. They are termed as protective food because of their nutraceutical properties. If they can be supplied in fresh or preserved form throughout the year for human consumption, the national scenario will improve drastically.

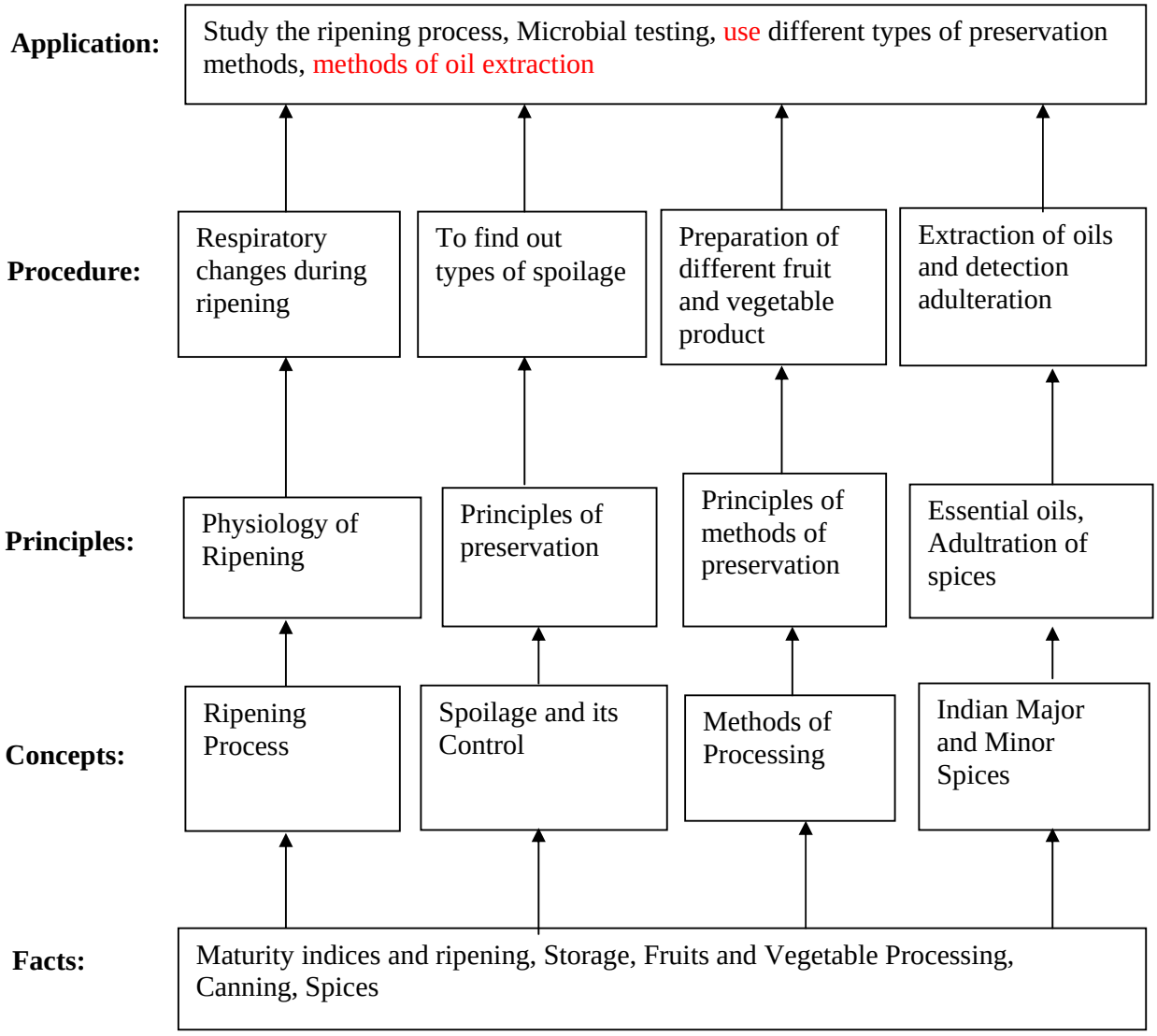
Fruit and vegetable for want of simple technology of processing, preservation and transport to various places of need. The processing includes pre-processing of fruits and vegetables, before these are fit to be used for final conversion into processed foods.

General objectives:

Students will be able:

1. Impart knowledge of different methods of fruits and vegetable preservation.
2. Learn about processing of various spices.
1. Understand classification of fruits and vegetables and explain its respiratory changes.
2. Select raw materials and its processing and storage.
3. Understand preparation of various fruits and vegetables products.
4. Know use of different preservation techniques.
5. Analyse final product for quality.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: MATURITY INDICES & RIPENING **Specific Objectives:** ➢ Describe maturity Indices of fruits and vegetables. ➢ Identify ripening changes and control ripening process. **Contents:** 1.1 Introduction: (Marks-06) • Classification of fruits & vegetables, Harvesting and maturity indices (physical & chemical, Physiological, etc.) for fruits & vegetables 1.2 Ripening process: (Marks-06) • Ripening of fruits & vegetables - Respiratory changes during ripening, Physiology of ripening, use of ethylene and its mechanism, Use of plant growth regulators and hormones	08	12
Topic 2: SELECTION OF QUALITY **Specific Objectives:** ➢ Describe Pre-processing techniques of fruits and vegetables **Contents:** • Selection of quality of raw materials including fruits & vegetables, Sorting & grading (Marks-04) • Storage of fresh fruits & vegetables (MAS, CAS, Hypobaric, Cool storage) Microbiology of fresh fruits & vegetables spoilage and its control, Packaging and marketing of fresh fruits & vegetables (Marks-08)	08	12
Topic 3: VEGETABLE PROCESSING **Specific Objectives:** ➢ Describe process and Preparation of vegetable products ➢ Prepare of tomato products. **Contents:** 3.1 Potato and Sweet potato Processing: (Marks-06) • Potato-Chips, Frozen patties, French fries processing, Flours, Granules, Sweet potato - Chips, Flakes, Uses of sweet potato 3.2 Carrot and mushroom Processing: (Marks-06) • Carrot processing Toffee and Canning, • Mushroom processing - Freeze drying, Pickles, Dehydration, Canning 3.3 Tomato Processing: (Marks-08) • Selection of tomatoes, pulping & processing of tomato juice, tomato puree, paste, chutney, ketchup, sauce and soup	14	20
Topic 4: FRUIT PROCESSING **Specific Objectives:** ➢ Describe process and Preparation of fruit products techniques ➢ Prepare fruit beverages, Jam, Jelly and marmalades. **Contents:** 4.1 Fruit beverages: (Marks-10)	17	28

• Introduction, Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification) preservation of fruit juices (pasteurization, use of chemical preservatives, preservation by sugars, freezing, drying, aseptic processing, carbonation), processing of squashes,Kokam, cordials, nectars, concentrates and powder 4.2 Jam, Jellies , Marmalades and fruit preserves : (Marks-18) • Selection, Preparation, Regulations in production & preservation • Fruit preserves, Candied, crystallized & glazed fruits, Fruit leathers, bars & toffees		
Topic 5: PICKLES & CHUTNEYS **Specific Objectives:** ➢ Describe curing techniques ➢ Identify defect and their causes **Contents:** • Methods of preparation, Curing techniques, Defects, their causes and prevention	05	08
Topic 6: CANNING OF FRUITS & VEGETABLES **Specific Objectives:** ➢ Draw flow diagram of canning process ➢ Identify spoilage of canned foods ➢ Describe drying and dehydration of fruit and vegetable **Contents:** • Principles, , syrups and brines for canning, Canning of fruits and vegetables, spoilage of canned food • Drying & dehydration of fruits & vegetables (Raisin, Anardana, Mango bar, onion slice Jackfruit bar, dried fig, leafy vegetables)	08	12
Topic 7: SPICES **Specific Objectives:** ➢ Describe Major and Minor spices in india ➢ Identify adulteration of spices **Contents:** • Spices and other constituents, Condiments, Essential oils, Adulteration of spices, essential oils	04	08
Total	**64**	**100**

Practical:
Skills to be developed:

Intellectual Skills

1. Analyse of fruit and vegetable products with respect to FSSAI standards.
2. Study of maturity indices, its significance and changes that occur during ripening of fruits.
3. Understand changes during processing and precautions.

Motor Skills

1. Prepare of different fruit and vegetable products.

List of Practicals:

1. Ripening of banana, mango and papaya and observation of ripening changes.
2. Preparation of mushroom sauce, ketchup, mushroom in brine, dehydration of mushrooms.

3. Preparation of tomato products such as juice, puree, sauce, ketchup, chutney.
4. Preparation of pulp and extraction of juices
   - Preparation of common fruit beverages such as squashes e.g., lemon, orange, pineapple, mango, etc.
   - Cordials, fruit syrups, fruit crush, nectars, etc.
5. Preparation of jam, jellies, marmalades and candied fruits.
6. Preparation of fruit toffees, cheese, candy, etc.
7. Estimation of acid and sugar in food products such as jam, jellies, squash, cordials, canned fruits, etc.
8. Analysis of squash / tomato ketchup to meet FSSAI specifications.
9. Preparation of different types of pickles & chutneys.
10. Estimation of sodium chloride in different types of pickles, chutneys and tomato products.
11. Estimation of chemical preservatives like KMS, sodium benzoate in different types of processed products.(Add)

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Ranganna	Handbook of Quality Analysis and Quality Control of Fruit & Vegetable Products	Tata McGraw Hill Publishing Co. Ltd., New Delhi
02	ICMR	Manuals methods of analysis of adulterants and contaminants in foods	ICMR, New Delhi
03	S.N.Mahendru	Food Additives – Characteristics detection & Estimation	Tata McGraw Hill Publishing Co. Ltd., New Delhi
04	Edited by D.K.Salunkhe & S.S.Kadam	Handbook of Vegetable Science & Technology	Marcel Dekker Inc., New York
05	G.Subbulakshmi	Food Processing and Preservation	New Age International Publishers, New Delhi
06	R.P.Srivastava & Sanjeev Kumar	Fruit & Vegetable Preservation Principles & Practices	International Book distributing Co., Lucknow
07	Giridharilal Sidappa and Tandon	Fruit & Vegetable Preservation	ICAR New Delhi

LIST OF LABORATORY EQUIPMENTS:

Sr. No.	Name of Equipment	Technical Specification	Min.Qty./ Nos. Required	Remark Make/ Model
01	Mango Processing Plant & Machinery Mango Processing Plant & Machinery	omplete sets of Mango Pulp & Juice Production Line:- 1. Washing Machine 2. Sorting Conveyor 3. Elevator 4. Pulping Machine / turbo refiners 5. Tubular Preheater Pasteurizer 6. Filling & Packaging Line - Can Filling Machine / Bottle Filling Machine / Aseptic bag	**01**	

		Filling Machine / Gable top packaging / Easy to open can		
02	Paste-Grinder	We offer wet grinder to grind various edibles like chutni, curry paste, etc. Made up of steel, our wet grinder has a very hard and strong grinding stone. During grinding, no stone granules can be found in the food. Our wet grinder has an efficient electric motor and is available in various sizes of 3ltrs	**01**	
03	Steam Jacketed Kettles	This finds its usage in batch heating and cooking of different food products. It stands in a tilting arrangement on a heavy duty mild steel stand. Both jacket and pan are fabricated with S.S.-304 grade stainless steel of heavy gauge. The pan is 2/3 jacketed which provides maximum steam utilization and efficiency. It is available in the following capacities:25 gallons (110 Itrs.)	**01**	
04	FRUIT CRUSHER (CRUSHING MACHINE)	This fruit Crusher is ideal for various fruits and vegetables processing. It can be used to crush a variety of fruits and vegetables, such as berry, pear, apple, carrot, tomato, etc. Technical Parameters: • Production Capacity: 1-2T/hr • Cutter Rotational Speed: 310 rpm • Motor Power: 2.2 kW Dimensions: 910x600x1175 (mm)	**01**	
05	JUICE PRESS (TO EXTRACT JUICE FROM CRUSHED FRUITS)	This machine is ideal for various fruits and vegetables juice extraction. It is commonly used for juicing pineapple, tomato, apple, orange, etc. Technical Parameters: • Production Capacity: 1-5 T/hr • Spiral Screw Diameter: 75 mm • Rotational Speed: 400 rpm • Filter Net Pore Diameter: 0.3 mm • Motor Power: 4 kW • Weight: 240 kg • Dimensions: 1560x450x1340 (mm)	**01**	
06	Flanging Machine	Can Flanging Machine is a heavy duty model and is a simple hand operated machine. This is primarily used for simultaneous flanging of both sides of a round can. In order to operate the machine with minimum exertion a touggle motion balanced hand is provided. It is supplied with one die for 401 dia cans. Also available is spare flanging die 301 dia or 401 dia & 603 dia & 700 dia	**01**	
07	Pulping Machine:	This machine is ideal for various fruits and vegetables pulping. Features: • The pulp and residues are automatically separated.	**01**	

		• It can be combined with the process equipments line or can separately be used as a single machine. • All parts contacting fruits and vegetables are made of food grade stainless steel. Technical Parameters: • Filter Net Diameter: 400mm • Filter Net Length: 780mm • Number of Rows of Scraper : 3 • Scraper Angle: 0°-5° (adjustable) • Filter Net Pore Diameter: 1.1/1.2/2 (mm) • Motor Power: 2.2 KW • Motor RPM: 1420 • Process Capacity: 50Kg/hr-2500Kg/hr • Weight: 200Kg • Dimension: 1236x750x1250 (mm)		

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fifth

Subject Title : Food Plant Organisation and Management

Subject Code : 19520

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	--	03	100	--	--	--	100

Notes:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Management is basically a separate branch, it is multidiscipline it means it draws knowledge, concept, various disciplines, as psychology, philosophy, economics, spastics etc. Industry engineering is engineering approach to the detail analysis of the use of rescuers of an organization.

The main reassures are men, money, material, equipment and machinery, the industrial management carries out such analysis in order to achieve the objectives and policies of the organization.

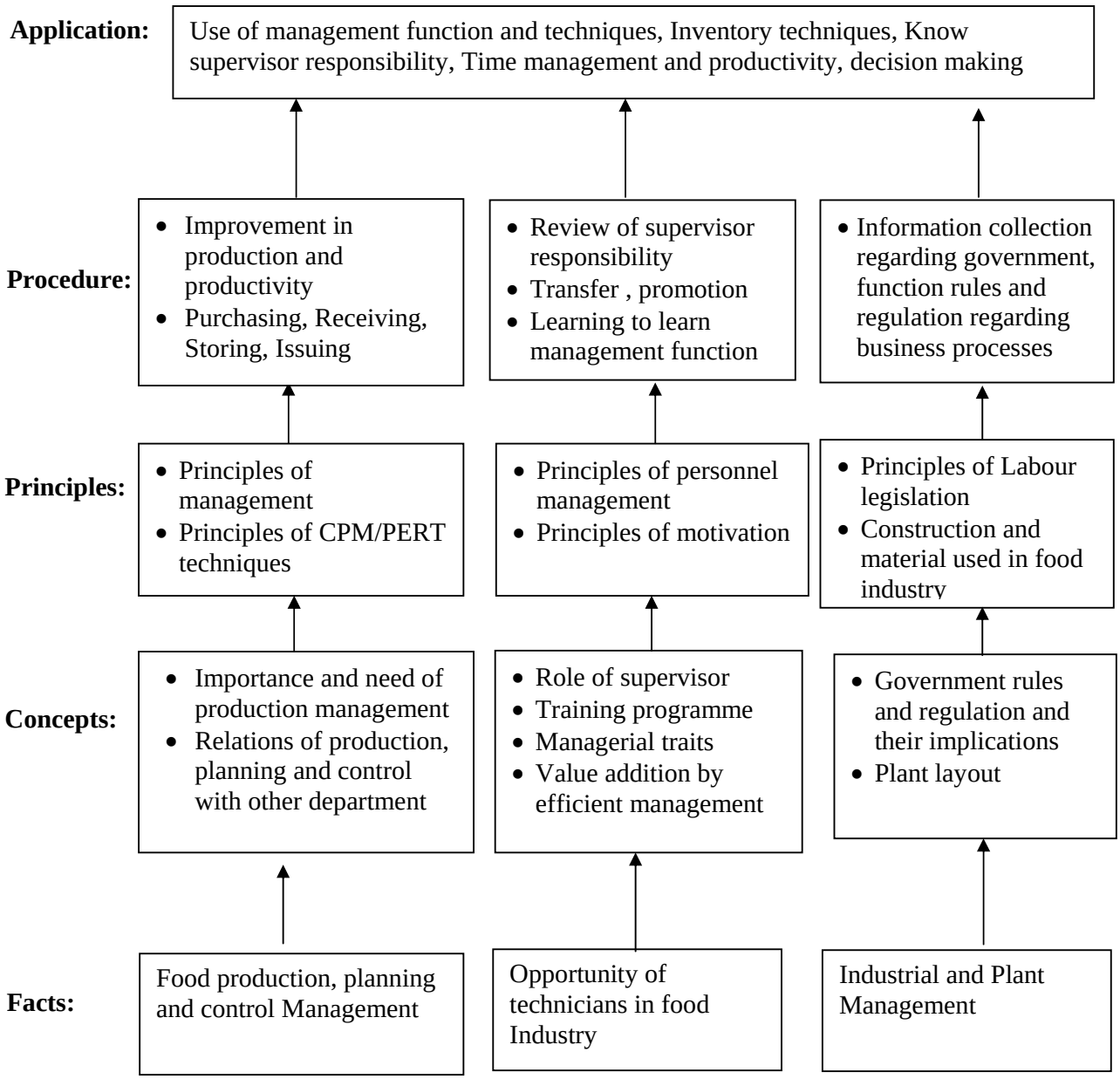
Organization has been operationalised as a collection of interacting and inter-dependent individual who would be working toward food processing.

General Objectives:

Students will be able to:

1. Develop team-work sprit and sense of co-operation among the employees.
2. Achieve predetermined goals and objectives.
3. Increase self-confidence to work in organization.
4. Understand inventory techniques, purchasing, storing ect.
5. Understand advantages and limitation PERT and CPM techniques.
6. Identify Building construction materials.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: PRODUCTION MANAGEMENT **Specific Objectives:** ➢ State meaning of CPM / PERT techniques ➢ Differentiate between production and productivity **Contents:** • Basic principles of management, importance and need of production management • Difference between production and productivity, improvement in productivity, best utilization of inputs and maximum outputs. Quantitative techniques - Inventory techniques, work study, CPM / PERT, investment theory, decision making	16	22
Topic 2: FOOD PRODUCTION, PLANNING AND CONTROL **Specific Objectives:** ➢ Describe the cycle of operation ➢ Write the importance's of production, planning and control **Contents:** • Introduction to food production, planning and control, differences between production, planning and control • Cycle of operation viz. Purchasing (types and methods), Receiving, Storing, Issuing, etc. • Meaning and importance of production, planning and control, relations of production, planning and control with other departments	16	24
Topic 3: PERSONNEL MANAGEMENT **Specific Objectives:** ➢ State personnel management ➢ Write the function of management **Contents:** • Definitions of personnel management, Meaning, importance and role of personnel management in Indian industries (Marks-8) • Functions of personnel management- Recruitment, Education and training programme, Industrial relations, Welfare, Placement problems, transfer, promotion and retirement, Salary and wage administration, Health, working conditions and safety, Employees-Employer relations, etc.	16	26
Topic 4: INTRODUCTION TO INDUSTRIAL MANAGEMENT **Specific Objectives:** ➢ Describe the theories of motivation ➢ State provision of the labour legislation **Contents:** • Introduction to industrial management, Motivation- Introduction, importance and theories of motivation • Principles of Labour legislation, types of laws Various acts of industrial management- Industrial dispute act, Factories act, Trade union act, employees state insurance act	10	18

Topic 5: PLANT ORGANIZATION MANAGEMENT **Specific Objectives:** ➢ Draw plant layout ➢ Describe methods of plant and factory layout **Contents:** • Introduction, Plant layout, Plan and Design, Methods of plant and factory layout, plant layout procedure, types of construction and material used for them.	06	10
Total	**64**	**100**

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	C.B.Mamoria	Personnel Management	Himalaya Publishing House
02	O.P.Khanna	Industrial Engineering & Management	Dhanpat Rai & Sons, Delhi

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fifth

Subject Title : Project

Subject Code : 19081

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	06	--	--	--	50#	50@	100

Rationale:

The project should enable students to combine the theoretical and practical concepts studied into useful applications. The work should enable the students to exhibit their ability to work in a team, develop planning, execution skills and perform analyzing and trouble shooting of their respective projects. The project work should be neatly documented without errors and should provide information related to the principle, working process, lay out design, formulation, analysis, costing, application and scope for future development.

Objectives:

The student will be able to-

1. Identify analysis & define the problem.
2. Generate alternative solutions to the problem identified.
3. Compare & select feasible solutions from alternatives generated.
4. Design, develop, manufacture & operate equipment/Program.
5. Acquire higher-level technical knowledge by studying recent development in mechanical engineering field.
6. Compare machines/devices/apparatus for performance practices.
7. Work effectively in team.

Content:

- The department head / in charge should make sure that the project groups are formed (two to four students each group) within one week of the beginning of the semester and assign a faculty as a project guide.
- The project group should interact with the guides, who in turn will advise the group in selecting a project based on the group-potential.
- The project should be selected within two weeks of the group formation **and brief synopsis of the project should be submitted to the HOD and guide.** The synopsis should include project title, aims, objectives, methodology and proposed activities.
- The group should work every week in the project duration and appraise the guide about their work progress. Guide should closely monitor the work and help the students from time to time. **The guide should also maintain a record of continuous assignment of project work progress on weekly basis.**
- Each student is required to **submit a project report** on the design of a food processing plant, selecting the best process with optimum equipment size and operating conditions. The object is to test the ability of the student to apply his entire knowledge of food processing technology principles to conceptualize, analyze and solve the problems.
- To judge his knowledge and originality and capacity for application of laboratory data in designing food processing plants and to determine the level of his proficiency at the end of the course.

Course Name : Diploma in Food Technology

Course Code : CH / FC

Semester : Fifth

Subject Title : Entrepreneurship Development and Industrial Project

Subject Code : 17073

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	01	--	--	--	--	--	25@	25

Rationale:

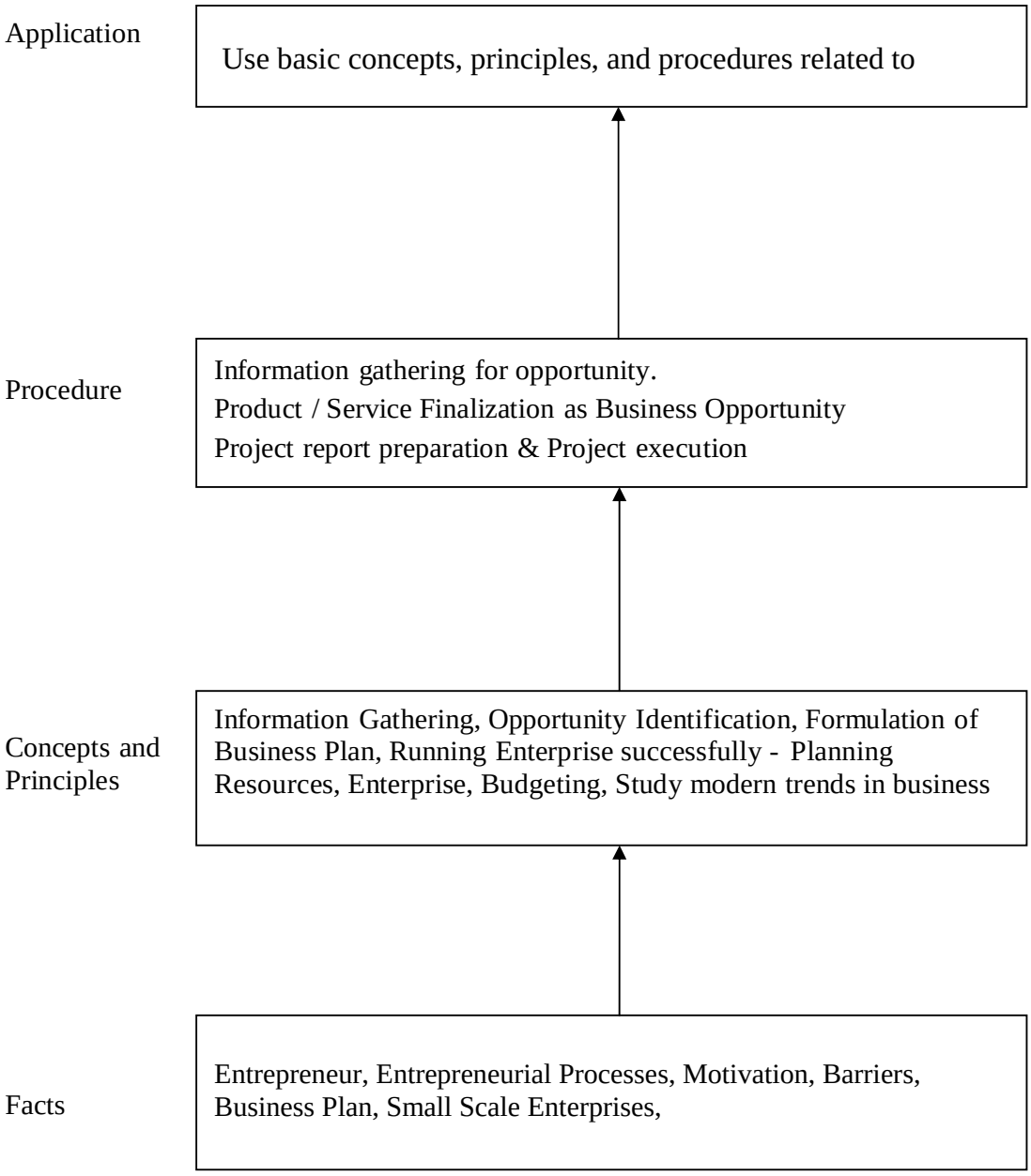
Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white- collar jobs. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

Objectives:

Students will be able to

1) Identify entrepreneurship opportunity.
2) Acquire entrepreneurial values and attitude.
3) Use the information to prepare project report for business venture.
4) Develop awareness about enterprise management.

Learning Structure:



Topics:

Topic	Name of Topic	Hours
01	**Entrepreneurship, Creativity & Opportunities** • Concept, Classification & Characteristics of Entrepreneur • Creativity and Risk taking, Risk Situation, Types of risk & risk takers. • Business Reforms. • Process of Liberalization. • Reform Policies. • Impact of Liberalization. • Emerging high growth areas. • Business Idea Methods and techniques to generate business idea. • Transforming Ideas in to opportunities transformation involves • Assessment of idea &Feasibility of opportunity • SWOT Analysis	03
02	**Information and Support Systems** • Information Needed and Their Sources: • Information related to project, Information related to support system, Information related to procedures and formalities • Support Systems • Small Scale Business Planning, Requirements. • Govt. & Institutional Agencies, Formalities • Statutory Requirements and Agencies.	02
03	**Market Assessment** • Marketing -Concept and Importance • Market Identification, Survey Key components • Market Assessment	02
04	**Business Finance & Accounts** ➢ Business Finance • Cost of Project • Sources of Finance • Assessment of working capital • Product costing • Profitability • Break Even Analysis • Financial Ratios and Significance ➢ Business Account • Accounting Principles, Methodology • Book Keeping • Financial Statements • Concept of Audit	03

05	**Business Plan & Project Report** • Business plan steps involved from concept to commissioning Activity Recourses, Time, Cost • Project Report • Meaning and Importance • Components of project report/profile (Give list) 5.3) **Project Appraisal** 1) Meaning and definition 2) Technical, Economic feasibility 3) Cost benefit Analysis	03
06	**Enterprise Management And Modern Trends** ➢ Enterprise Management: • Essential roles of Entrepreneur in managing enterprise • Product Cycle: Concept and importance • Probable Causes Of Sickness • Quality Assurance: Importance of Quality, Importance of testing • E-Commerce: Concept and Process ➢ **Global Entrepreneur** • Assess yourself-are you an entrepreneur? • Prepare project report and study its feasibility	03

List of Assignments:

1. Write the SWOT Analysis required for an successful entrepreneur.
2. Collect the required information, formalities and supporting systems for starting a small scale business.
3. Collect information regarding key parameters required for market analysis of an electrical industry.
4. Search for current available sources of finance to start a new business and write a report.
5. Write a report on different accounting methods, financial statements and audit.
6. Write a report on preparing a good business plan.
7. Collect information on E-commerce system and write a report on how it is useful for entrepreneurs.
8. Prepare a report on how to become a successful entrepreneur?

Learning Resources:
1) Books:

Sr. No	Author	Title	Publisher
1	J.S. Saini B.S.Rathore	Entrepreneurship Theory and Practice	Wheeler Publisher, New Delhi
2	Prepared by Colombo plan staff college for Technician Education.	Entrepreneurship Development	Tata McGraw Hill Publishing Co. Ltd. New Delhi.

3	J. B. Patel D. G. Allampally	A Manual on How to Prepare a Project Report	EDI STUDY MATERIAL Near Village Bhat, Via Ahmadabad Airport & Indira Bridge, P.O. Bhat 382428, Gujrat, India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
4	Gautam Jain Debmuni Gupta	New Initiatives in Entrepreneurship Education & Training	
5	Schaper, Michael Volery	Entrepreneurship- Small Business	Wiley India,2011
6	Alpana, Trehan	Entrepreneurship	Dreamtech, 2011

2) Video Cassettes:

No	Subject	Source
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for Completion & Growth	
5	Problem Solving-An Entrepreneur Skill	

PART B) Industrial Project

Following activities related to project are required to be dealt with, during this semester

1. Form project batches & allot project guide to each batch. (Max. 4 students per batch)
2. Each project batch should select topic / problem / work by consulting the guide & / or industry. Topic / Problem / work should be approved by Head of department.
3. Each project batch should prepare action plan of project activities & submit the same to respective guide.
4. At the end of semester, each project batch should submit the action plan and abstract of the project along with list of materials required if project involves fabrication or other facilities required in other kinds of project.
5. Action Plan should be part of the project report.
6. Each group member shall write assignments on the action plan prepared for the project for this semester (half of the project work). The assessment of the assignments will be considered for next semester as a total term work.

Group	Project

Course Name : All Branches of Diploma in Engineering & Technology

Course Code : EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/ CO/CM/IF/ EE/EP/CH/PS/CD/ED/EI/CV/FE/FG/IU/MH/MI/TX/TC/DC/AU/ML/FC/PN/SC/TR

Semester : Fifth for EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/CO/CM/IF/ EE/EP/CH/PS/AU/ML/FC/PN/SC/TR and Sixth for CD/MH/IU/CV/FE/FG/MI/ED/ EI/DC/TC/TX

Subject Title : Behavioural Science

Subject Code : 17075

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	25 #	25 @	50

Rationale:

With increased globalization and rapid changing business expectations, employers are looking for wide cluster of skills to cater to the changing demand. Personality traits and soft skills are playing a key role in a student's career in this changing scenario. Corporate houses look for soft skills that supplement hard skills.

Addition of behavioural science in curriculum is intended to enhance the efficiency of a person so that he can contribute to overall growth of organisation. It aims at developing insight into leadership, team building, motivation, interpersonal relationship, problem solving, decision making and aspects of personality in a technician's profile. Addition of the topic of organizational culture will further mould him/ her in the organisational role.

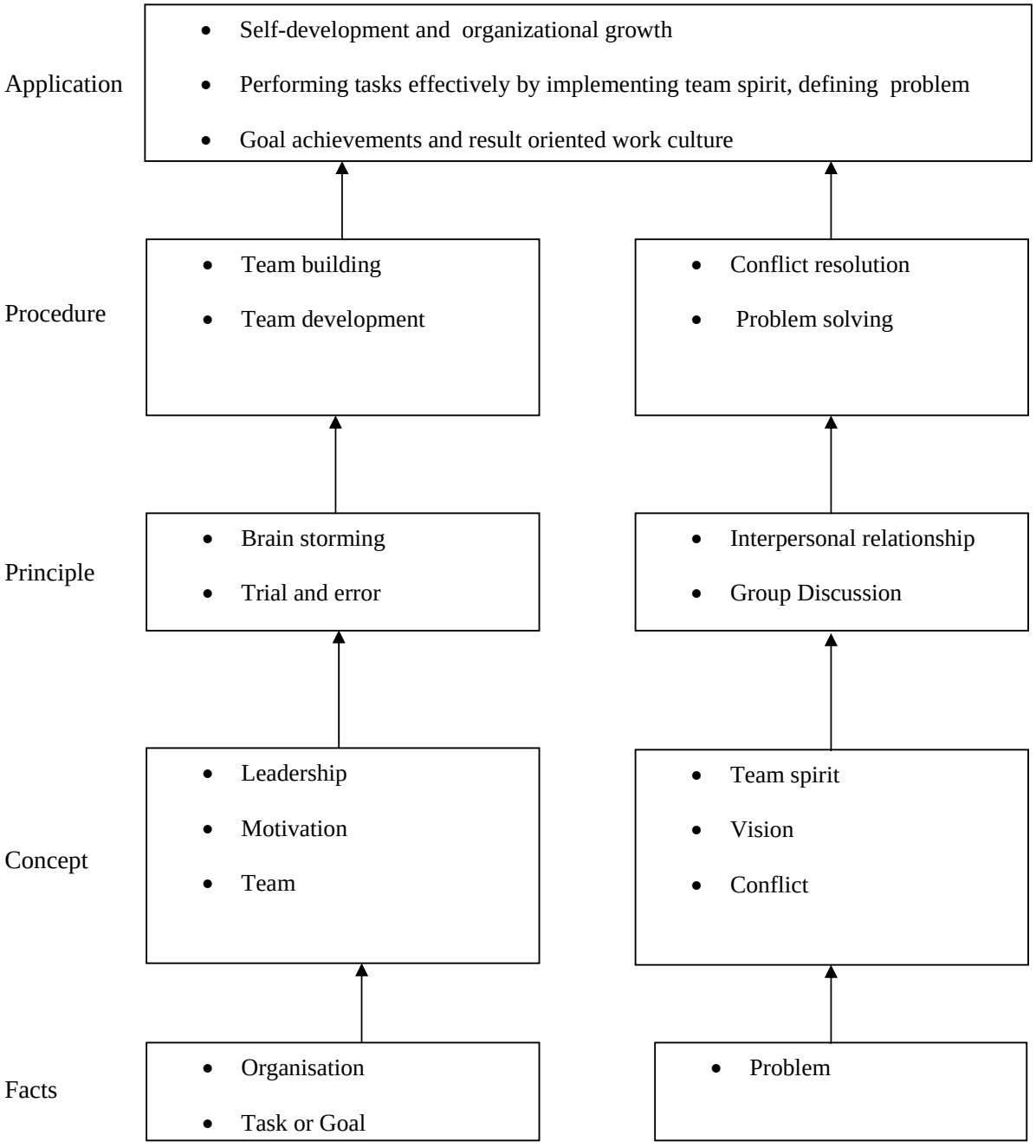
This subject of 'Behavioural Science' provides a broad base in which a technician can develop a successful career in the world of work.

General Objectives:

After studying this subject, the students will be able to:

1. Develop him/her as Team leader.
2. Use self-motivation and motivate others.
3. Build a team and develop team spirit among the team members.
4. Improve the interpersonal relationship skills.
5. Learn Problem solving and decision making skills.
6. Discuss a particular topic in a group and face the interview.

Learning Structure:



Theory:

Topic and Contents	Hours
Topic 1: Leadership 1.1 Management Education-History, Development, Importance, Areas of specialization, need and importance of behavioural science. 1.2 Meaning and Types of Leaders, Qualities of leader, Examples 1.3 Leadership- Definition, importance, leadership in various organizations 1.4 Leadership styles-task -people matrix. Persuasive, Authoritative, Democratic, Delegative Leadership styles. Maturity of followers, situational leadership	02
Topic 2: Motivation 2.1 Meaning 2.2 Importance of Motivation 2.3 Types of Motivation- Intrinsic, Extrinsic, Examples 2.4 Maslow's motivation theory- pyramid of needs, individual and industrial applications 2.5 Tips for Motivation	02
Topic 3: Emotional Intelligence 3.1 Major concepts - emotion, families of emotion, components of emotional expressions 3.2 Emotional intelligence, cognitive intelligence 3.3 Basic emotional competencies	02
Topic 4: Team Building 4.1 Team- Need, Definition, Difference between group and team 4.2 Characteristics of a good team 4.3 Steps in team formation- forming, norming, storming, performing, adjourning 4.4 Roles of team members 4.5 Characteristics of a good team member 4.6 Types of teams-Work, mgmt, cross functional, quality circle, self-managed team	03
Topic 5: Conflict Resolution 5.1 Definition, types (interpersonal, intrapersonal, groups), indicators of conflicts 5.2 Sources of conflict - ego, poorly defined authority and responsibility, power, interests, greed, difference in value system, complex work situations 5.3 Skills for conflict resolution 5.4 Steps in conflict management -Mapping of conflict, negotiation- steps in negotiation, 5.5 Styles of conflict management- collaborating, competing, cooperating, avoiding, compromising	03
Topic 6: Decision Making 6.1 Importance of decision making 6.2 Definition Characteristics of good decision 6.3 Characteristics of good decision	02

6.4 Types of decisions- programmed, non programmed, strategic, tactical, impulsive 6.5 Group decision making 6.6 Steps of decision making	
Topic 7: Interview Techniques 7.1 Job search opportunities 7.2 Development of résumé´ and cover letter- essentials of a good résumé´, contents of Résumé´, layout of résumé´, cover letter 7.3 Group discussion- objectives, do's and don'ts for effective participation, evaluation parameters, suggested topics 7.4 Psychometric tests- Aptitude test, guidelines for preparations for aptitude test, Personality test 7.5 Personal interview-guidelines for preparing for job interviews, common questions	**02**
Total	**16**

Practical:
Skills to be developed:

Intellectual Skills:

- Develop ability to find his strengths
- Select proper source of information.
- Follow the technique of time and stress management.
- Set the goal.

Motor Skills:

- Follow the presentation of body language.
- Work on internet and search for information.
- Prepare slides / transparencies for presentation.

List of Assignments:

01	Case study: Employee motivation and leadership.
02	To build a tower from a given material as a team activity
03	To prepare Jigsaw puzzles (common shapes) from the given jigsaw pieces as a team.
04	Case study on conflict Resolution
05	Assess your style of conflict resolution
06	Decision making activity: of Selection of the best suitable company.
07	Participate in a guided group discussion
08	Assessment of self-aptitude in numerical computation, estimation, data interpretation, mechanical, spatial and abstract reasoning
09	Assessment of self-aptitude in Verbal ability and data checking.
10	Development of résumé´ and covering letter

Note: Subject teacher shall guide the students in completing the assignments based on above practicals.

Learning Resources:

Books:

Sr. No.	Author	Name of Book	Publication
1	Subject Experts-MSBTE	Handbook and assignment book on Development of Life Skills-II	MSBTE
2	Dr. Kumkum Mukherjee	Principles of management and organizational behaviour	Tata McGraw Hill Education Pvt Ltd.
3	Dr.T.Kalyana Chakravarti Dr.T.Latha Chakravarti	Soft Skills for Managers	Biztantra
4	Barun K Mitra	Personality Development and soft skills	Oxford University Press
5	Priyadarshini Patnaik	Group discussion and interview skills	Foundation Books

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Sixth

Subject Title : In-Plant Training

Subject Code : 19903

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
20 weeks	--	--	--	--	--	50#	50@	100

Rationale:

The industrial training of four weeks is integral part of course work, and therefore, the students who have appeared in the Fifth semester for in plant training in various Food industries throughout the country. This training helps them to develop essential qualities that are required to face the challenges and problems in industry, education and in research.

General Objectives:

Students will be able to:

1. Develop understanding of various field activities in which students are going to play a role as food technologists after completing diploma.
2. Develop understanding of subject based knowledge given in the class room in the context of its application at work places
3. Gain firsthand experience and confidence amongst the students to enable them to use and apply knowledge and skills to solve practical problems in the field
4. Develop of special skills and abilities like interpersonal skills communication skills, attitudes and values
5. Develop perfect knowledge about the theoretical part in syllabus.
6. Know about hygiene and sanitation in industry.
7. Set the goal for personal development.
8. Solve problems with confidence.

INDUSTRIAL TRAINING

Details:

- For the fulfillment of above objectives, polytechnic(s) offering diploma course in food technology may establish close linkages with 8 - 10 food processing and preservation industries/organizations
- The industries/organizations may be contacted by the teachers and students for project oriented and professional training of students during third year.
- The practical industrial training has to be well planned, structured and supervised by polytechnic teachers clearly specifying complete schedule of the students on day to day basis for whole of their training period.
- Proforma may be prepared by polytechnics related to the concerned industries to access daily, weekly and monthly progress of the students and the students must be asked to fill these proformas regularly duly signed by them and countersigned by personnel from industry and concerned teacher attached to a particular student. Each teacher is suppose to supervise and guide 4 to 6 students.

Following schedule, as a sample, is proposed for the training

1) Familiarization and Training about Various Food Processing Operations

Students should be familiarized with various materials, principles and operations involved in processing of different types of food used for different purposes

2) Specific Task

- Students should be given specific task related to following:
- Complete flow chart and plant layout for food-processing unit
- Preparation and preservation of food products, including raw material
- Identification, testing and processing
- Hygiene and sanitation for a food processing and preservation unit
- Fault diagnosis and rectification

3) Problem-Solving Work Site

- After undergoing above two phases of vigorous practical project orientation professional training, students may be given practical problems, which are of interest to industry where he/she is taking practical training. The problem should be identified and guided by the personnel from industry in collaboration with teacher and the solutions suggested by the students may be tried

Note: Students are supposed to prepare detailed notes of each of above phases of training and write complete report of the whole of practical industrial training which shall be used for the learning and evaluation purposes

The students after completing 20 weeks industrial training in any food industry will have to submit their in plant training report (at least 20 pages) separately each students. It will be considered as a term work. The report should have following contents.

Contents of the Report:

1. Acknowledgment

2. In-plant training certificate
3. Introduction of industry
4. Raw material and processing
5. Processing equipments
6. Industry lay- out
7. Process flow charts
8. Packaging
9. Quality control or analysis
10. Effluent treatment
11. Conclusion

***Assessment Criteria**

Recommended Books:

1. Food Preservation by SK Kulshrestta, Vikas Publishing House, New Delhi
2. Fundamentals of Food and Nutrition by Sumati R. Mudambi & MV Rajagolap, New Age International Pvt. Ltd. New Delhi.
3. Food Processing and Preservation by Bibliography Sivasankar, Prentice Hall of India Pvt. Ltd., New Delhi.
4. Managing Food Processing Industries in India by U.K. Srivastva
5. Hand Book of Entrepreneurship by B.S. Rathore
6. Microbiological Safety of Processed Foods by Crowther
7. Food Poisoning & Food Hygiene by Hobbs
8. Drying & Storage of Grains & Oilseeds by Brodoker
9. Fundamentals of Food Process Engg. By Toledo
10. Chocolate, Cocoa & Confectionery by Minifie
11. Safe Food Handling by M. Jacob
12. Food & Beverage Service by Andrews
13. The Science of Cookie & Cracker Production by Faridi
14. Snack Food by Booth
15. Food Additives by Mahindru
16. Dough Rheology & Baked Product Texture by Faridi