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 : THIRD **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 (19300)
								MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1	Principles of Food Engineering	PFE	19320	04	--	02	03	100	40	--	--	25#	10	25@	10	50
2	Food Biochemistry & Human Nutrition	BHN	19321	04	--	02	03	100	40	--	--	--	--	25@	10	
3	Food Analysis	FAS	19322	04	--	04	03	100	40	50#	20	--	--	25@	10	
4	Bakery and Confectionery Technology	BCT	19323	03	--	02	03	100	40	--	--	--	--	25@	10	
5	Computer Application	COA	19042	--	--	04	--	--	--	50#	20	--	--	25@	10	
6	Professional Practices-I	PPR	19043	--	--	03	--	--	--	--	--	--	--	50@	10	
			TOTAL	**15**	**--**	**17**	--	**400**	**--**	**100**	**--**	**25**	**--**	**175**	**--**	**50**

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

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 750**

@ 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 2009-10**

SEMESTER : FOURTH **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 (19400)
								MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1	Environmental Studies $	EST	17401	01	--	02	01	50#*	20	--	--	--	--	25@	10	50
2	Flesh Food Technology	FFT	19412	03	--	02	03	100	40	25#	10	--	--	25@	10	
3	Fermentation Technology	FTE	19413	04	--	02	03	100	40	25#	10	--	--	25@	10	
4	Food Process Engineering	FPE	19414	04	--	04	03	100	40	--	--	--	--	50@	20	
5	Food Safety and Quality	FSQ	19415	03	--	04	03	100	40	50#	20	--	--	25@	10	
6	Professional Practices-II	PPR	19060	--	--	03	--	--	--	--	--	--	--	50@	20	
			TOTAL	**15**	**--**	**17**	--	**450**	**--**	**100**	**--**	**--**	**--**	**200**	**--**	**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.

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Third

Subject Title : Principles of Food Engineering

Subject Code : 19320

Teaching and Examination Scheme:

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

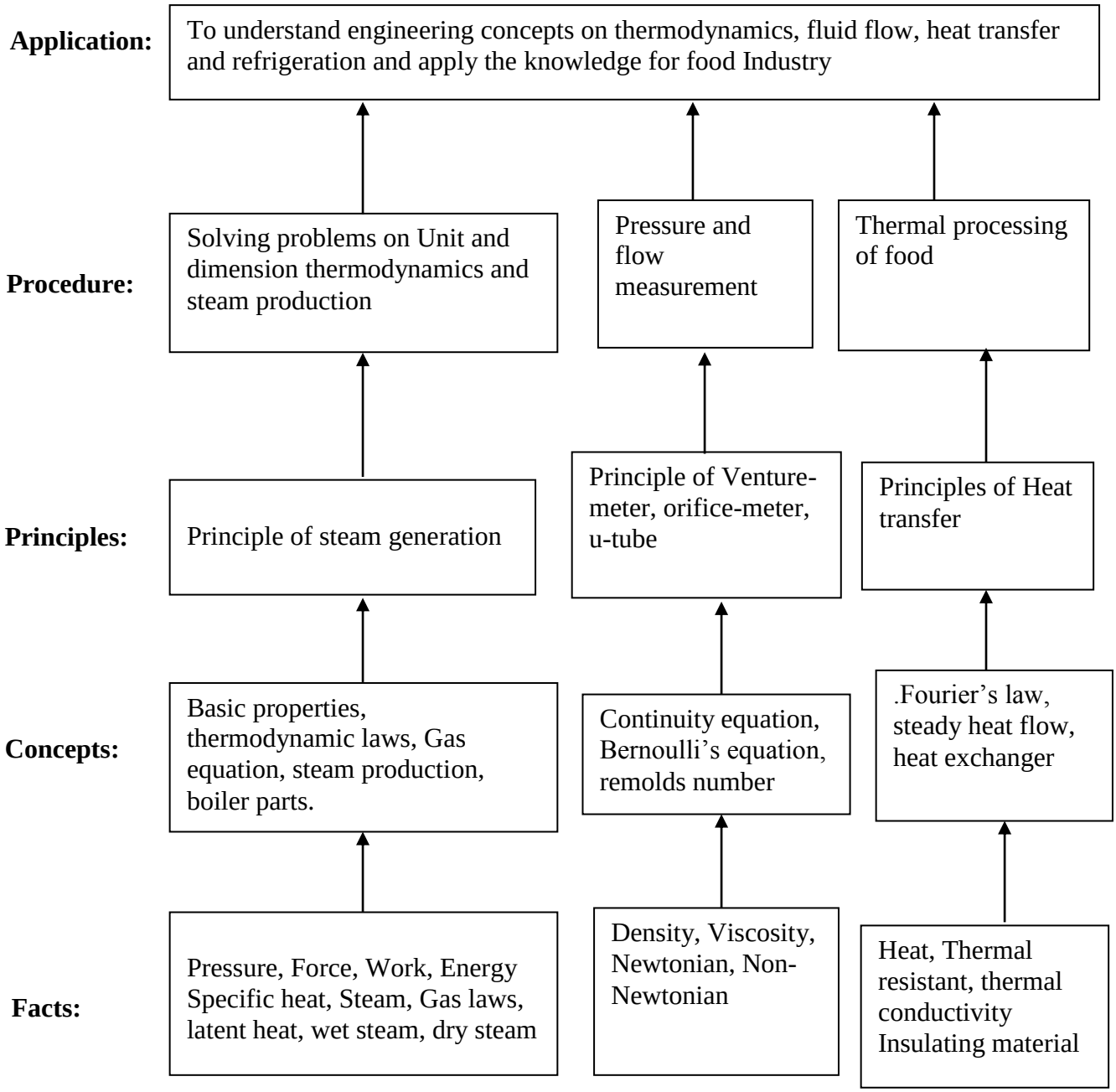
Running the food plant requires various utilities such as refrigeration, steam generators, pumps, power transmission devices, vacuum producing devices, compressors and heat exchangers. Food technologist is required to have the knowledge principles involved in working of these units. This subject covers principles, working and construction and application of various plant utilities and equipments.

General Objectives:

Students will be able to:

1. Understand the engineering concepts with more emphasis on fluid flow, refrigeration, vacuum devices, power transmission, heat transfer and steam generation.
2. Understand the principles of Unit operations
3. Acquaint with fundamentals of food engineering and its process
4. Understand Handling of steam and psychometric chart.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: UNITS AND DIMENSIONS **Specific Objectives:** ➢ Define related terms in units and dimension ➢ State various unit and convert them from one to another **Contents:** • Systems of units, base, derived and multiple units, conversion and use of dimension equalities (Force, density, volume, pressure, work, energy, power, heat, temperature etc.)	04	08
Topic 2: FUNDAMENTALS OF THERMODYNAMICS **Specific Objectives:** ➢ Calculate the heat required for steam production. ➢ Solve problem on gas process ➢ Define related terms in thermodynamics. **Contents:** 2.1 Thermodynamic: (Marks-06) • Basic properties, Laws of thermodynamics Elementary thermodynamic gas laws, General gas equation, Specific heat and gas process. 2.2 Steam production at constant pressure: (Marks-06) • Thermodynamic properties of steam, Enthalpy of water, latent heat, enthalpy of dry saturated steam, enthalpy of superheated steam, wet steam, problems by using steam table	10	12
Topic 3: FLUID FLOW AND POWER TRANSMISSION **Specific Objectives:** ➢ Classify the fluid and fluid flow. ➢ Describe principle, construction and working of pressure and flow measurement device. ➢ Sketch the power transmission device. **Contents:** 3.1 Fluid Flow: (Marks-16) • Properties of fluid, basic equation of fluid, Bernoulli's equation and its application pressure and flow measurement devices (Venturi-meter, orifice meter pitot tube Rota -meter etc.), classification of fluid • Pumps for fluid flow and Vacuum producing devices 3.2 Power Transmission (Marks-06) • Mechanical power transmission devices – belt, chain and gear Classification, applications and limitations in use, velocity ratio, driving system	14	22
Topic 4: BOILER **Specific Objectives:** ➢ Listing Boiler parts and types ➢ Describe the construction and working of boiler parts **Contents:** • Common terms, Classification, construction and working of fire tube and water tube boiler. • Boiler accessories and mountings (Safety valve, water level indicator, pressure gauge, fusible plug, super heater, Air pre heater and economizer)	08	14

Topic 5: REFRIGERATION PRINCIPLES **Specific Objectives:** • State Principle of refrigeration system • Sketch the different freezing equipment. **Contents:** 5.1 Principles of Refrigeration: (Marks-08) • Vapor compressor refrigeration and vapor absorption refrigeration system properties of common refrigerants , refrigerants classification , C.O.P. and one unit of refrigeration and graphical refrigeration cycle 5.2 Refrigeration application: (Marks-08) • Freezing methods (direct and indirect), construction and working of freezer equipments, Air blast, multi-plate , fluidized bed, immersion and cryogenic freezing process quality change in foods during frozen storage	12	16
Topic 6: HEAT TRANSFER **Specific Objectives:** • Calculate the heat loss by conduction. • Define related terms in heat transfer • Describe methods of heat transfer in food Industry- **Contents** 6.1 Modes of heat transfer: (Marks-10) • Conduction- Fourier's law, heat transfer to plain wall, composite wall, Thermal conductivity, Heat flow through cylinder and Thermal Insulation problem on conduction heat transfer • Convection –Types, Heat transfer coefficient and log mean temperature difference • Radiation- Absorption, Transmission and Reflection, black body, white body, transparent body etc 6.2 Heat Exchangers (Marks-08) • Heat transfers involved in food industry, Source of heat, heat media, and heat exchangers used in food Industry (Plate, Tubular, Shell and tube, Spiral and scrapped surface Tubular)	10	18
Topic 7: PSYCHOMETRIC **Specific Objectives:** • Draw psychometric chart and labeled • Define the terms in psychometric • Calculating relative humidity by using psychometric chart **Contents:** • Principles and definition, properties of dry air, Humidity ,Relative Humidity, Dry bulb temperature, wet bulb temperature, dew point temperature , Humidity measurement and Psychometric chart.	06	10
Total	**64**	**100**

Practical:

Skills to be developed:

Intellectual Skills

1. Understand the principles related to unit operations and unit processes in food industry.
2. Verify the principles, laws by using different models.

Motor Skills

1. Observe the construction and working by using different models.
2. Measure pressure, flow rate, humidity with respect to food industry.

List of Practicals:

1. Measurement of pressure by using U-tube manometer.
2. Measurement of fluid flow rate by using venture-meter.
3. Verification of Bernoulli's equation.
4. Demonstration of centrifugal and reciprocating pump
5. Measurement of Specific gravity and viscosity of food sample
6. Measurement of Temperature by thermocouples, thermostats, radiation thermometer.
7. Measurement of pressure by using pressure gauge, vacuum gauge, electronic pressure sensors.
8. Measurement of relative humidity by using psychometric chart.
9. Study of power transmission devices (different models of power transmission devices their advantages and limitations in food industry).
10. Industrial visit to study the steam boiler and refrigeration system.

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
01	Arora and Domkundwar	A Course in Heat and Mass Transfer	--
02	S.R.Ramamutham	Fluid Mechanics, Hydraulics and Fluid Machine	--
03	R.C.Patel and C.J.Karamchandani	Elements of heat engines	Acharya Book Depot, Vadodara
04	Ramaswamy H and Marcotte	,Food Processing Principles and Applications	M CRC Press

List of laboratory equipments:

Sr. No.	Name of Equipment	Technical Specification	Min.Qty./ Nos. Required	Remark Make/ Model
1	Venturimeter	Venturimeter for 1" pipe line Convergent cone: 15-17deg Divergent cone: 5 - 7 deg Throat dia: 1.5-1.8 cmDifferential manometer for pressure drop Measurement Manometer tappings at throat & upstream	1	
2	Orificemeter	Orifice plate placed between two flanges with an orifice of suitable Do/Dp ratio. Differential manometer of 1 m height. Manometer tappings to be provided at up stream & downstream	1	
3	u tube manometer	1 meter height, 0.5 cm glass tube ID mounted on wooden board with 1 meter scale	1	
4	Bernoulli's Apparatus	Supply & receiving chambers with scale & glass tube fittings for the measurement of total potential head, & inter linking duct made of thick transparent pipe with variable cross section. Quality glass piezometer tubes for measuring the pressure head along the duct, & a flow control valve.	1	
5	Centrifugal Pump Test	a. Centrifugal pump of size 1" x 1" to discharge 60 LPM at 30 m. coupled to 1 HP motor total head 35 m. The characteristics being supply at different speeds against different heads. 01 no b. Variable speed arrangement by reduction Pulley. c. Pressure gauge, Vaccum gauge & Foot valve. d. Energy meter, switch, starter & stop clock. e. Measuring tank of size 0.45 m. x 0.45 m. x 0.75 m with scale fitting & 2 " drain valve	1	
6	Reynolds apparatus	Reynolds apparatus	1	
6	Model & Chart of i) Babcock & wilcox Boiler ii) Cochran Boiler iii) Lancashire Boiler iv) Loeffler boiler	Models of Acrylic / Aluminium material Plastic coated sheets for charts of size 3 feet X 3 feet	Each-1	
7	Model & Wall Chart's of Boiler	Models of Acrylic / Aluminium material Plastic	Each-1	

	Mountings :- i) Water level indicator ii) Steam stop valve iii) Spring loaded/ Dead Weight Saftey Valve iv) Fusible Pulg v) Feed check Valve vi) Blow off cock vii) Bourdon Pressure gauge. Wall Chart's of Boiler Accessories:- i) Economiser ii) superheater iii) Air Filter	coated sheets for charts of size 3 feet X 3 feet		
8	Model / charts of Pumps centrigugal pump **No table of figures entries found.**	Reciprocating Pumps, Vane pump, Gear Pump	Each-1	
9	Models of Power Transmission i)Belt Drives ii) Chain Drives iii)Gear Drives including reduction gearbox,worm & worm wheel iv) Rope Drives	Models / charts of i)Belt Drives :-flat belt, V–belt ii) Chain Drives:- Chain & Sprocket wheels iii)Gear Drives :- Spur gear terminology, types of Different gears and gear trains iv) Rope Drives :-Wire ropes etc	Each-1	
10	Wall Chart of Vapour Compression refrigeration system	Wall charts of PVC / Acrylic material	1	
11	Wall charts of PVC / Acrylic Material	Wall charts of PVC / Acrylic material	1	
12	Wall Chart of Psychrometric chart	Wall charts of PVC / Acrylic material	1	

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Third

Subject Title : Food Biochemistry & Human Nutrition

Subject Code : 19321

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	--	--	25@	125

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:

Food is the basic necessity of life. Everybody eats food and most people enjoy it. From the beginning scientists were curious about the food they consumed, its passage in the body and its effects. This curiosity led to the development of the science of nutrition. Nutrition is defined as the scientific study of food and its relation to health.

In the beginning of twentieth century interest in nutrition was mainly related to energy needs of the human body i.e., how much energy is obtained from different constituents of foods like carbohydrates, proteins and fats. Minerals and vitamins were studied in detail when they were discovered to be important nutrients.

Biochemistry has its roots in fermentation, nutrition, agriculture, medicine and natural products chemistry. Today, it is principally concerned with the chemistry of molecules found in and associated with living systems, especially the chemistry of the interactions of these molecules. The usually unspoken assumption is that the activities of cells must be susceptible to explanation as chemical and physical phenomena. Developing this understanding has required the careful application of chemical and physical laws and methods in combination with the careful biological manipulation of the systems under study. Several modern biochemical approaches take advantage of technology advances to study intact systems.

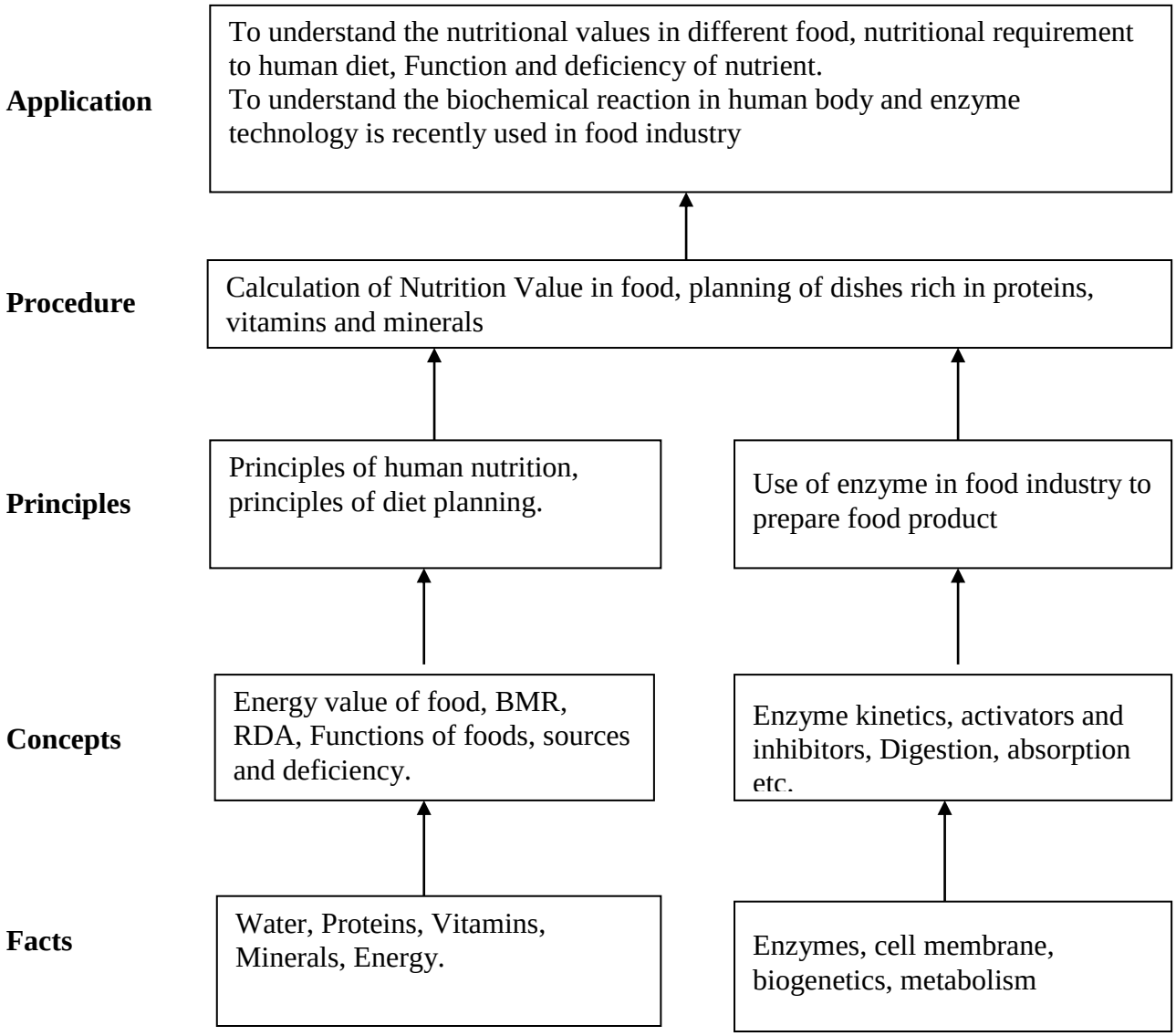
General Objectives:

Students will be able to:

1. Understand the relationship between food, nutrition and health.
2. Understand the functions of food. Learn about various food groups and balanced diet.
3. Prepare diet planning according to the nutritional requirement of an individual.
4. Understand digestion, absorption and function of various nutrients and their sources.

5. Understand kinetic of enzymes in biochemical reactions
6. Understand purpose of enzyme technology in food industry.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: INTRODUCTION TO NUTRITION **Specific Objectives:** • Define related terms in Nutrition • List food group **Contents:** • Food as a source of nutrients, functions of foods, definition of nutrition, nutrients, adequate nutrition, optimum nutrition, malnutrition • Inter-relationship between nutrition and health visible symptoms of good health	06	12
Topic 2: VITAMINS AND MINERALS **Specific Objectives:** • Classify the vitamins and minerals • List sourse of RDA • Describe Source, Function and Deficiency of vitamins and minerals **Contents:** 2.1 Vitamins: (Marks-10) • Classification, units of measurement, sources R.D.A., functions and deficiency of following fat soluble vitamins - Vitamin A, Vitamin D, Vitamin E, Vitamin K. • Water soluble vitamins - Ascorbic acid, Thiamin, Riboflavin, Niacin, other members of B complexB_6 and B_{12} 2.2 Minerals: **(** Marks-08) • Functions, sources, bioavailability, R.D.A. and deficiency of following minerals - calcium, phosphorus, iron, sodium, potassium	12	18
Topic 3: PROTEINS AND ENERGY **Specific Objectives:** • Planning and calculate nutrition value of protein rich dish. • Calculate energy value of food by bomb calorimeter • Write Source, Function and Deficiency of Protein **Contents:** 3.1 Proteins**:** (Marks-08) • Composition, source, essential functions, amino acids and protein deficiency 3.2 Energy: (Marks-08) • Unit of energy, energy value of food, bomb calorimeter Body's need for energy, B.M.R., Factors affecting energy requirement	10	16

Topic 4: ENZYMES **Specific Objectives:** • Classify the enzymes and its kinetic activity • State role of enzymes in Food production **Contents:** 4.1 Introduction of Enzyme (Marks- 08) • Definition, Importance, Classification and nomenclature, Coenzymes and Cofactors, Enzyme specificity, Enzyme kinetics, Enzyme activators and inhibitors 4.2 Enzyme Technology (Marks- 08) • Techniques of enzyme immobilization, Isolation and purification of enzymes, Enzymes in food processing	10	16
Topic 5: METABOLISM OF CARBOHYDRATES **Specific Objectives:** • Define related terms in metabolism • Describe various digestion, absorption cycles in human system **Contents:** • Digestion and absorption of carbohydrates, Glycolysis, Tricarboxylic acid (TCA) cycle Hexose monophosphate shunt, Glycogenesis, Glycogenolysis, Gluconeogenesis	10	14
Topic 6: METABOLISM OF LIPIDS **Specific Objectives:** • Draw various digestion, absorption cycles of lipids • Describe oxidation of fatty acid in Human body **Contents:** • Oxidation of fatty acids, Synthesis of fatty acids, Ketosis and ketoacidosis,	08	12
Topic 7: METABOLISM OF PROTEINS **Specific Objectives:** • Draw digestion and absorption process of protein • Describe metabolism of amino acids **Contents** • Urea cycle, Transamination, deamination, Metabolism of amino acids.	08	12
Total	**64**	**100**

Practical:
Skills to be developed:

Intellectual Skills
1. Understand Calculation of costs of various dishes.
2. Know use of NIN standard charts for dish planning.
3. Understand comparison with RDA.

Motor Skills
1. Plan various dishes according to nutrient requirement.

List of Practicals:
1. Planning of the following with calculation of its cost

Various dishes using protein rich foods or mixture of protein rich foods, each dish should provide minimum 5 gm protein per serving.

2. Planning of the following with calculation of its cost -
   Dish with high, moderate and low energy (more than 200 kcal, and less than 100 kcal respectively).
3. Planning of the following with calculation of its cost -
   (a) Dish with calcium rich foods (about 15 mg, calcium per serving).
   (b) Dish with rich source of iron (2 mg iron per serving).
4. Planning of the following with calculation of its cost and preparing dish -
   (a) Dishes using vitamin A / carotene rich food (Minimum 500 mcg. Per serving of carotene or 125 mcg. Of retinal per serving).
   (b) Dishes with rich source of thiamin (about 0.12 mg per serving)
   (c) Dishes with rich source of Vitamin C foods (about 20 mg per serving)
   (d) Dishes rich in many nutrients (multi nutrient rich dishes)
5. Estimation of Energy value in different food products by using bomb calorimeter.
6. Assessment of nutritional status of an Individual by anthropometric method and diet survey.
7. Estimation of Iron / Calcium given food sample
8. Estimation of vitamin C / Vitamin A given food sample

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
01	Mahtab S. Bamji, N. Prahlad Rao, Vinoini Reddy	Text book of Human Nutrition	Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
02	Seema Yadav	Text book of Nutrition and Health	Anmol Publication Pvt. Ltd New Delhi.
03	Shubhangini Joshi	Nutrition and Dietetics	Tata McGraw Hill, New Delhi
04	M.A.Siddiqi, A.Q.Siddiqi	Handbook of Biochemistry	Unique offset press, Patna
05	A.Lehninger	Text book of Biochemistry	--
06	Eric E. Conn	Outlines of Biochemistry	John Wiley and Sons (Asia) Pte Ltd., Singapore
07	Sunetra Roday	Food science and Nutrition @th Edition	Oxford University Press.
08	Ritta singh	Food Biotechnology	Global Vision Pub.House 2005
09	Sinosh Skariyachan	Introduction of Food Biotechnology	CBS Pub.2012
10	Anjana Agrawal	Text Book of Human Nutrition	JPB2014 Pub.

List of laboratory equipments:

Sr. No.	Name of Equipment	Technical Specification	Min.Qty./ Nos. Required	Remark Make/ Model
1	Bomb calorimeter			

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Third

Subject Title : Food Analysis

Subject Code : 19322

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:

Historically the growth of food control parallels the development of food productions. Such production is dependent upon the availability of suitable raw materials and the ability of the food processor to produce foods of the quality demanded, both by the consumer and those agencies which act for this protection.

During the past hundred years there has been a rapid expansion in the production of raw, processed, blended and preserved foods due to the growth and application of knowledge to accommodate urbanization and an increasing world population. It is in the interests of both the consumer (who is to some extra protected by of both the consumer) (who is to some extent protected by the activities of consumer associates, consumer protection agencies and public analysis) and the food manufacturer to ensure the most efficient and safe use of food resources. The increased demand for food has therefore resulted in a corresponding increase in demand for analytical data to monitor the composition, properties and nutritional value of raw materials and finished products.

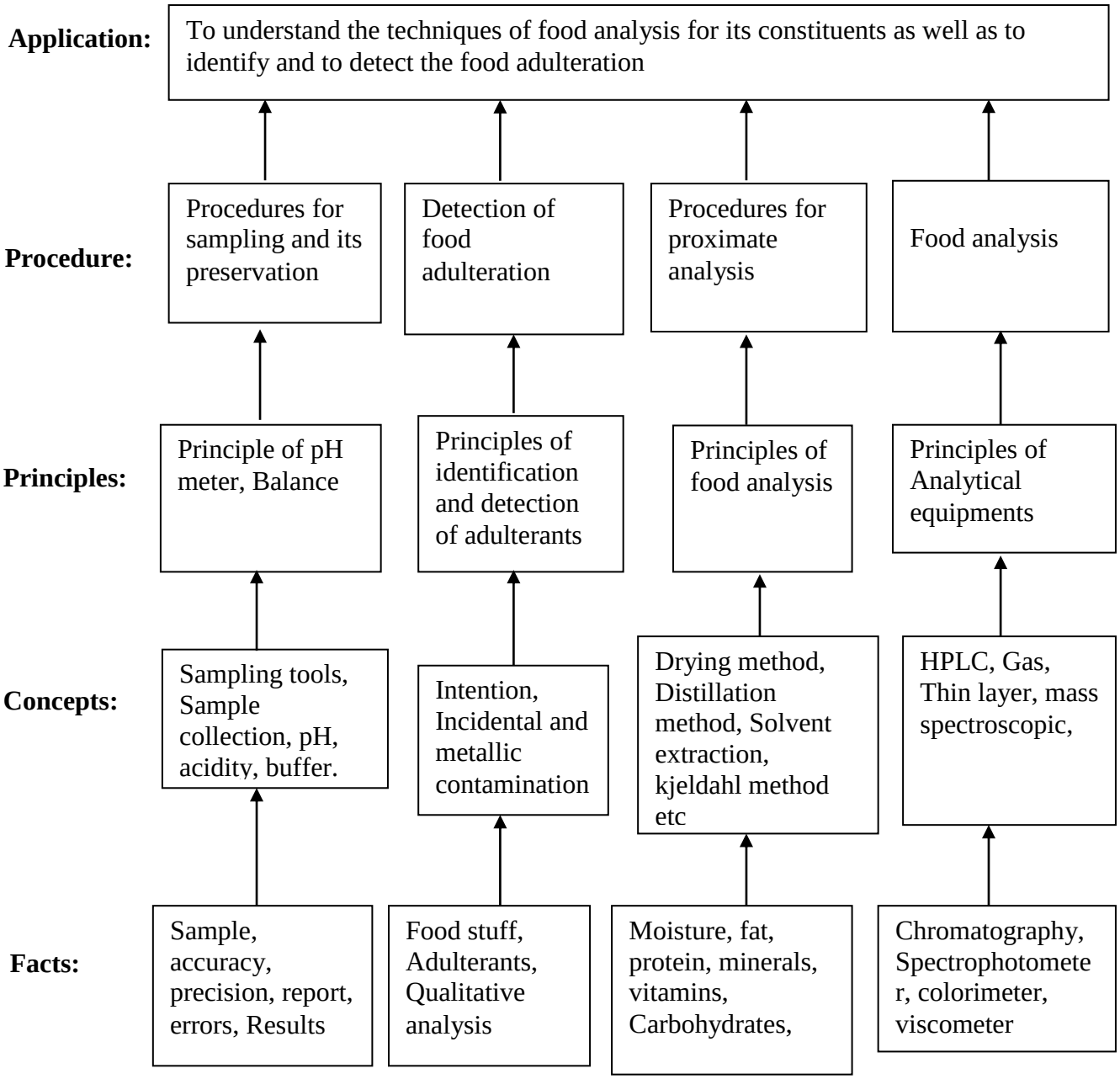
The food technologist who is to have a broad appreciation of food sources, processes and uses must have a good working knowledge not only of the constraints upon the food processing industry but also the scientific and technological basis of such constraints, and be equipped to monitor food materials at all stages of production. Since natural and processed foods are intrinsically complex system, a clear appreciation of the applications and limitations of analytical techniques is essential in research, development or quality control to enable the food technologist to interpret analytical data in the context of the food material or process from which they derive.

General Objectives:

Students will be able to:

1) Understand the sampling techniques
2) Understand the purpose of food analysis and equipments and procedures involved in food analysis.
3) Detect of food adulteration
4) Understand the legal requirement of food analysis laboratory and laws related to food analysis.

Learning structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: INTRODUCTION OF FOOD ANALYSIS **Specific Objectives:** ➢ Describe sampling tools and its uses. ➢ Write procedure of different food sample preparation. **Contents** 1.1 Food Laboratory (Marks-08) • Legal requirements for laboratory of food analysis ,Sample types, Quantity of sample, Preparation of sample for analysis, Maintenance of samples ,records and Sample preservation methods and techniques viz. container, field, requirement procedure 1.2 Sampling tool (Sketch, construction and use) • Oil thief, tube, Trier, drill, pelican etc. (Marks-04)	10	12
Topic 2: ANALYTICAL RESULTS AND pH MEASUREMENT **Specific Objectives:** ➢ Define related terms in analytical results ➢ Calibrate thef pH meter. **Contents:** 3.1 Analytical results: (Marks-06) • Accuracy, precision, errors in analysis, reporting results, reliability and reproducibility of results of food analysis 3.2 pH Measurement: (Marks- 06) • Definition of pH, concept of acidic and basic, buffer systems, pH meter construction, working and calibration.	08	12
Topic 3: ADULTERATION **Specific Objectives:** ➢ Describe procedure of detection of adulteration in different food. ➢ List different adulterants added in to food **Contents:** • Definition, types, detection of adulteration by Simple, Physical and Chemical methods and visual examination in Milk and milk products, Spices ,Oil, Tea, Coffee, Dhal, semolina Rava, Pulses, Maida, Honey and other	08	16
Topic 4: ANALYSIS OF PROXIMATE CONSTITUENTS **Specific Objectives:** • State principles of Proximate Analysis of food • Draw flow sheet of proximate analysis procedure. • Write formula of Proximate analysis **Contents:** Detection of Proximate constituents of foods by different methods 4.1 Moisture: ……(Marks 14) • Oven drying methods, Reflux distillation, Hydrometer, Psychomotor, refract meter, Karl-Fisher reagent method, NIR based rapid Moisture analyzer. • Ash analysis: Dry ashing and Wet ashing (principle, procedure and formula) • Carbohydrate analysis: –Lane-Eymon method for reducing and non reducing sugar, Colorimeter method, polaro-method, brix meter and HPLC. • Crude fat analysis: - Solvent extraction method (soxhlet)	12	24

Non solvent wet extraction method (Gerber) 4.2 Protein analysis: ……..(Marks-10) • Kjeldahl method(principle, digestion, distillation and titration) Biuret method (application, principle and procedure) • Titrable acidity:- equivalent weight, normality, Preparation of reagents stander alkaline, acids, procedure and calculation. • Mineral analysis:-colorimetric method –calcium and phosphorus. • Crude fiber-Digestion method		
Topic 5: SPECTROSCOPY AND CHROMATOGRAPHY. **Specific Objectives:** • Describe construction and working of analytical equipments • Define the terms in Chromatography and spectroscopy. **Contents:** 1.1 Spectroscopy-……(Marks-08) • Basic principles, definitions of wavelength, frequency, velocity • Ultraviolet visible spectroscopy-Beers law, Principle, construction, working and application. 1.2 Chromatography-……(Marks-08) • Classification, General terminology, principle of separation, • Chromatographic techniques Paper, Thin layer, column chromatography, Gas Chromatography, Liquid chromatography construction, working and application • HPLC-Construction, Working, and application.	14	22
Topic 6: ANALYTICAL TECHNIQUES **Specific Objectives:** • State conditions of use of analytical equipments, • Describe construction and working of analytical equipments • Define the terms in resent analytical techniques. **Contents:** Principles Construction, working and application- Techniques of food analysis such as • Colorimetric • Viscometer • Flame photometer • Electrophoresis • Refract meter • Polaro-meter.	12	14
Total	**64**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. To understand the sampling tools, sample preparation, preservation and proximate analysis.
2. Detection of adulteration of different foods.

Motor Skills:

1. To adopt proper procedure while performing the experiment.
2. To prepare the standard solutions required for food analysis.

List of Practicals:

1. Estimation of moisture by different methods. .
2. Preparation of standard solutions and Indicators

e.g., (1 N NaOH, 1 N I_2, 0.1 N $AgNO_3$, 0.1 N $K_2Cr_2O_7$, 0.1N HCL and 0.1N H_2SO_4)

3. Estimation of Titrable acidity in food sample
4. Determination of pH in different food products
5. Estimation of total ash in food sample
6. Estimation of fat by Soxhlet method in oil seed sample
7. Determination of vitamin C in food sample
8. Detection of adulteration of various food products. (Detection of adulteration in Milk and milk products , Spices, Oil, Tea, Coffee, Dhal, Rava, Pulses, Maida, Honey, silver paper, saffron and other)
9. Estimation of Crude fiber in given sample
10. Estimation of calcium by colorimeter.
11. Estimation of phosphorus by colorimeter
12. Identification of color by paper chromatography
13. Identification of amino acid / sugar by paper chromatography
14. Visit to any food testing laboratory / / Research & Development unit /analysis lab. of food Industry/ Public health lab.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	S. M. Khopkar	Text book of Analytical Chemistry – 1st Edt.	Willey John
02	S. N. Mahindru	Handbook of Food Analysis	Swan Publisher, New Delhi
03	Pearson David	Chemical Analysis of Food – 8th Edt.	Churchill Livingstone, Edinburgh, London & New York
04	M.B.Jacobs	The Chemical Analysis of Food and Food Products – 3rd Edt.	C.B.S. Publisher and Distributor, New Delhi.
05	Bureau of Indian Standerd	ISI Handbook of food Part I, II,III,IV, VIII, IX, X, XI, XII, XIII, XIV, XV	Indian Standerd Instudards New Delhi
06	AOAC	Official Methods of Analysis	Association of Official Agriculture chemists Washington D.C.
07	Alpheus G.woodman	Food analysis	Rarebooks club. com

08	Cilitton E. Meloan	Food analysis	CBS Pub. Dist. New Delhi
09	Nilesn S S	Food analysis 3rd	Springer India
10	Catalan	A course in food analysis	Hand press publishing.
11	RS.Suzanne Nelsen	Food analysis	Springer
12	Ranganna	Analysis of fruit and veg.	New age pub.and dis.new Delhi
13		NIN Mannual	ICMR

List of laboratory equipments:

Sr. No.	Name of Equipment	Technical Specification	Min.Qty./ Nos. Required	Remark Make/ Model
1	Infrared rapid moisture analyzer	Timer-1 - 120 minutes (interval of 10 seconds) , Temperature range 50 ° C to 200 ° C (interval 1 ° C) Display the contents of% moisture,% s olids, time, temperature, weight, ed Pan Size (cm) diameter 9 Dimensions (width × height × leng th) (cm) 19 × 15.2 × 36	01	
2	drying ovens	Studio Size mm height X width X depth: 350X350X350 Overall Size mm height X width X depth: 530X640X550 Voltage V: 220/50Hz Power KW: 1 Temperature ℃: room temperature ~ 250 Accuracy ℃: ± 1 ℃ Timing range: 3	01	
3	soxhlet extraction apparatus	A4nge of applications can be used to extract the food, feed, fuel, soil samples the extraction of each batch of samples Two extract bottle volum 500ml / extract the sample volume 0.5-20g / a the extraction time can be adjusted the extraction solven can automatically recycle Temperature range ambient +5 oC, ~ 100oC the power supply voltage 220V +10 V Frequency 50Hz the electric heating power 300W Dimensions (mm) 750 × 360 × 550 Weight 16kg	01	
4	pH plan/acidity meter	Measuring range- pH:-2.00-19.99PH mV:- 1999-1999mV temperature: (-10-110) ℃, Automatic temperature compensation (0-110) ℃, Stored content Measuring the value of number, measurement value, temperature, ATC or MTC status, date of measurement, the measuring time quality and safety certification ISO9001: 2000, CE, and CMC	01	
5	Portable digital display	emperature measurement range 0 °C -40 °C (32 ° F - 104 ° F)	01	

	Refractometer	Temperature measurement accuracy ± 0.2 °C (°F) Temperature measurement accuracy 0.1 ° C (1 ° F) Use temperature range 0 °C -35 °C (32 °F -90 °F) Storage temperature 0 °C -50 °C (32 °F -122 °F) Dimensions 135 × 65 × 40mm Net Weight 200g Power 2 x AAA (1.5V)		
6	Laboratory economical UV-VIS Spectrophotometer	Optical system CT grating monochromator, 1200/mm Wavelength range 195 nm ~ 1020 nm Spectral bandwidth 5nm Wavelength accuracy ± 2nm Wavelength repeatability 1.0nm Photometric range 0 to 199.0%, 0 ~ 1.999A, 0 ~ 1999C Photometric accuracy ± 0.5% T Photometric Repeatability 0.3% T Measurement of optical path 100nm Stray light ≤0.3% T (220nm Department) Stability ± 0.004A / h (500nm, warm-up to one hour) Display LCD 4 Signal output RS232C Light 6V10W imports PHILIP tungsten lamp imported long-life deuterium lamp Operating voltage 220/110VAC 50-60Hz	01	
7	Laboratory high - quality rotary viscometer	Measuring range 1 ~ 1 × 105mPa.s Rotor specifications 1, 2, 3, 4, the low viscosity of the four rotor (rotor is optional, can be measured to 0.1 mPa.s at) Instrument speed 6/12/30/60 turn / min Measurement error ± 5% (Newtonian fluid) Power Supply 220V ± 10V; 50Hz Net weight 5.5kg Dimensions 400 × 370 × 150 mm	01	
8	outside calibration 0.01 g / 2100 g precision balance	The model APEX-LJ362 Outside calibration Range (g) 2100 Readability (g) 0.01 Repeatability (standard deviation) (g) 0.01 Linearity error (± g) ± 0.02 Operating Temperature Range (℃) 10-30 Calibration automatic external calibration, optional weights Pan Size (cm) 16.8 × 18 Power Requirements AC adapter (included) Dimensions (width × height × length) (cm) 22 × 8.5 × 30	01	
9	Digital constant temperature water bath the shaker	model PEX-LJ354 convolution speed range start~300rpm Temperature range Room temperature ~ 50 ℃ (digital) Temperature accuracy ±0.5℃ Oscillation Mode convolution heating power 300W oscillation amplitude 20MM timing range 0 ~ 120 min or often open power supply AC220V 50HZ	01	

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Third

Subject Title : Bakery and Confectionary Technology

Subject Code : 19323

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

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:

Knowledge of the production and utilization of cereal grains is fundamental to solving the food supply problem facing the majority of the world's population. Cereals (including wheat, corn, barley, rice, sorghum, millets, etc) are therefore not only important direct sources of food for humans, but also make a substantial contribution to the diet, indirectly as fodder, for farm livestock producing meat, milk and eggs.

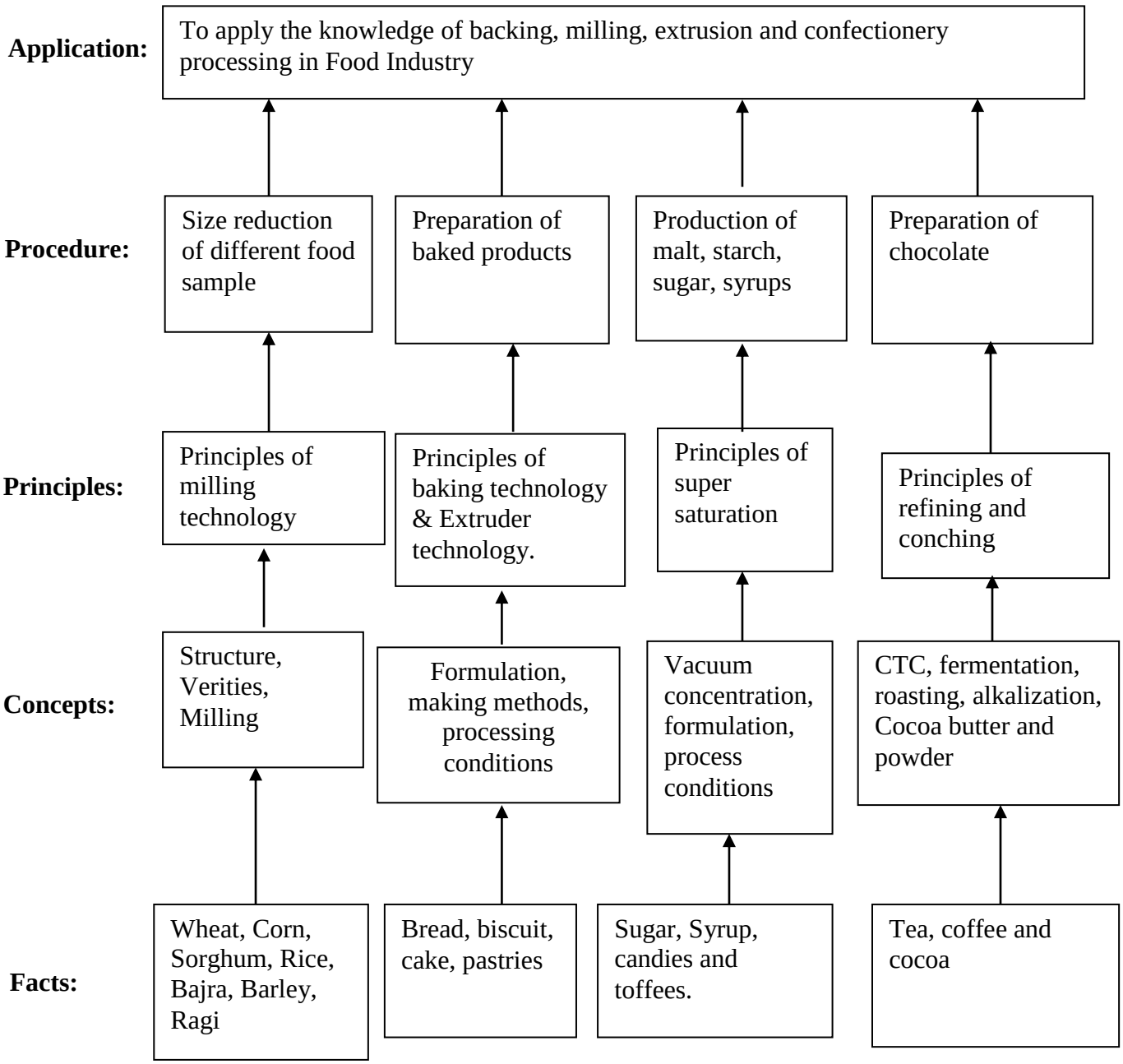
Optimal utilization of cereal grains requires the knowledge of their structure and composition. The practical implications of kernel structure are numerous. They relates to the stages of grain production, harvest, storage, marketing and use. The food technologist is required to have the knowledge of chemistry of cereals, their composition, structure and technology of their utilization. This subject covers the milling of cereals, baking, extrusion and snacks food processing.

General Objectives:

Students will be able to:

1. Understand status of bakery and confectionary industry in India
2. To learn the technologies bakery and confectionary products.
3. Know about recent advances in development of novel processed products.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: STRUCTURE, VARIETIES AND CLASSIFICATION OF CEREAL GRAINS **Specific Objectives:** ➢ Describe chemical composition and varieties ➢ Draw structure of cereal grains ➢ State condition of cereal storage. **Contents:** 1.1 Introduction of cereal: (Marks-06) • Major and minor cereal grains in India, Nutritional value of cereals, storage, utilization of cereals 1.2 Structure, varieties and classification: (Marks-06) • Wheat, Rice, Corn, Sorghum, Bajra, Barley, etc	06	12
Topic 2: MILLING OF CEREAL GRAINS **Specific Objectives:** ➢ State the principle of rice parboiling. ➢ Draw flow sheet of milling process ➢ Describe manufacturing process of cereal flour. **Contents:** 2.1 Rice milling (Marks-04) • Rice parboiling ,Cleaning, shelling, polishing and grading, 2.2 Wheat milling (Marks-06) • Storage, cleaning, Tempering, Break and reduction rolls, shifter, bleaching, Enrichment and storage of flour, 2.3 Corn milling (Marks-06) • Dry and wet milling process , By product and its utilization in milling process Nutritive losses during milling and minimization of losses	06	16
Topic 3: BAKERY **Specific Objectives:** ➢ List raw material and their role ➢ Prepare baked products, handling the bakery processing equipments ➢ State conditions of bakery products process. ➢ Draw flow sheet of bakery products production process. **Contents:** 3.1 Bakery Processing (Marks-10) • Bakery Products: Ingredients , processing stages, function, formulations and methods for breads, buns, pizza base, biscuits, cookies & crackers, cakes & pastries and doughnuts 3.2 Processing equipments and conditions. (Marks-06) • Equipments used product quality characteristics, faults and corrective measures for above bakery products. Defining and assessing quality of ingredients & products.	08	16

Topic 4: CORN AND DURUM WHEAT PRODUCTS **Specific Objectives:** • Describe Processing conditions and unit operations • Prepare Extruded Foods **Contents** 4.1 Corn Products (Marks-06) • Corn grits, flakes, starch, corn syrup, etc. 4.2 Pasta products (Extruded Foods) (Marks-06) • Extrusion machine, raw materials processing conditions Production of Macaroni, spaghetti, vermicelli and Noodles.	06	12
Topic 5: SNACK FOOD PROCESSING **Specific Objectives:** • Describe process of third generation foods • Describe the Process of Breakfast cereals food preparation **Contents:** • Production & quality of breakfast cereals, macaroni products and malt, Recent trends in snacks food processing, extruded cereal foods, breakfast cereal foods, cereal based baby foods	08	14
Topic 6: CONFECTIONARY **Specific Objectives:** • List ingredients' and their role • Describe production process of confectionery products. **Contents:** 6.1 Ingredients and role (Marks-06) • Manufacturing of Sugar and Glucose syrup, Non nutritive sweeteners 6.2 Confectionary Products (Marks-10) • Cake icings, hard-boiled candies, toffees, fruit drops, chocolates and other confections- ingredients, equipments & processes, product quality parameters	06	16
Topic 7: TEA, COFFEE & COCOA PROCESSING **Specific Objectives:** • Classification and processing of Tea and Coffee • Describe process of technology of cocoa and its utilization **Contents:** 7.1 Tea and coffee (Marks-08) • Processing of Black, Green Instant, Red tea, Tea composition, Processing of Coffee fruit to coffee powder and Instant Coffee processing. 7.2 Cocoa processing (Marks-06) • Processing of Cocoa fruit, beans, nibs, Cocoa powder and butter, Chocolate processing (ingredients, mixing, refining, conching)	08	14
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Study physico-chemical properties of cereals.
2. To observe the milling and baking process in industry.
3. Analyze the cereal flour and quality control of final product.
4. Select of raw material, understand precaution taken during processing and study different methods of processing.

Motor Skills:

1. Prepare of different bakery products.
2. Describe the Milling of cereal grains.
3. State the requirement for baby food production.
4. Describe the Process of cereals such as malting.

List of Practicals:

1. Estimation of flour quality, gluten, ash, water absorption power and sedimentation Test
2. Sorghum malting and syrup production.
3. Preparation of sponge cake with icing and assessment of its quality
4. Preparation of cookies/biscuits and assessment of quality.
5. Preparation of bread by straight dough method with and without dough improvers and to study the difference.
6. Preparation of Khari / Pizza base and assessment of its quality
7. Chemical Analysis of any one bakery product
8. Preparation of fondant, fudge and brittles.
9. Preparation of chikki -
10. Preparation of candy and toffee and to perform quality assessment tests.
11. Preparation of Pasta products or Ready to eat food product.
12. Visit to baking industry / milling industry / confectionery processing Industry.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Grant M.Campbell, Collin Webb, Stephen L. Mckee	Cereals Novel uses & Processing	Plenum Press, New York
02	Samuel A. Matz	The Chemistry and Technology of Cereals as Food and Feed	CBS Publication, New Delhi
03	N.L.Kent & A.D.Evers	Kent's Technology of Cereals	Pergamon
04	Dubey, S.C.	Basic Baking 5th Ed	Chanakya Mudrak Pvt. Ltd.
05	Manay, S. & Shadaksharaswami	Foods: Facts and Principles	New Age Publishers.
06	Samuel A. Matz	Bakery Technology and Engineering	PAN-TECH International Incorporated
07	Barndt R. L	Fat & Calorie – Modified Bakery Products	Springer US.

List of laboratory equipments:

Sr. No.	Name of Equipment	Technical Specification	Min.Qty./ Nos. Required	Remark Make/ Model
01	Oven	Manufacturing and expiring finest quality bakery equipment like Gas Baking Oven. A Deck Oven can have one to four separate baking chambers. Each chamber has a flat surface that the product is placed on to bake. Many deck ovens have stone hearth surfaces. Deck ovens come available with or without steam and are very popular for bread and pizza baking. Available in Gas or Electric Models. **STANDARD FEATURES:** Stainless steel front. Inner baking sizes as per customer requirement. Counter balanced door Heavy chrome plated tubular steel door handle Angle iron frame Electro-mechanical control panel with upper and lower heat setting One-year parts warranty	**01**	
02	**Planetary Mixer**	Three-speed switch versions. Wide range of capacity, with bowls 10 litres and an option for reducing the bowl up to 60 litres. Stainless steel body machines available upon request.	**01**	
03	**Bakery Proofer**	**Baking proofer oven** that is designed as per customer requirement. Our proofers give efficient, uniform and high quality 100% steam. These bakery ovens are available in varied capacities i. E. Fixed type, trolley type & swing tray types for ascertaining uniform proofing before baking	**01**	
04	**Spiral Mixer**	Our clients can avail from us, a compactly designed range of **Spiral Mixer** that is meant for mixing all types of flour dough. These steady mixers are suitable for fast and better mixing and are highly appreciated for their efficiency and ease of handling. These mixers are offered to our clients in various flour capacities like 10 Kg	**01**	

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Third

Subject Title : Computer Applications

Subject Code : 19042

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	50#	--	25@	75

Rationale:

The market economy demands frequent changes in product design, also the data collection, analysis & retrieval at much faster rates. Computers being the inevitable part in an engineer's life, due to its inbuilt characteristics which helps him to do various tasks with acceleration

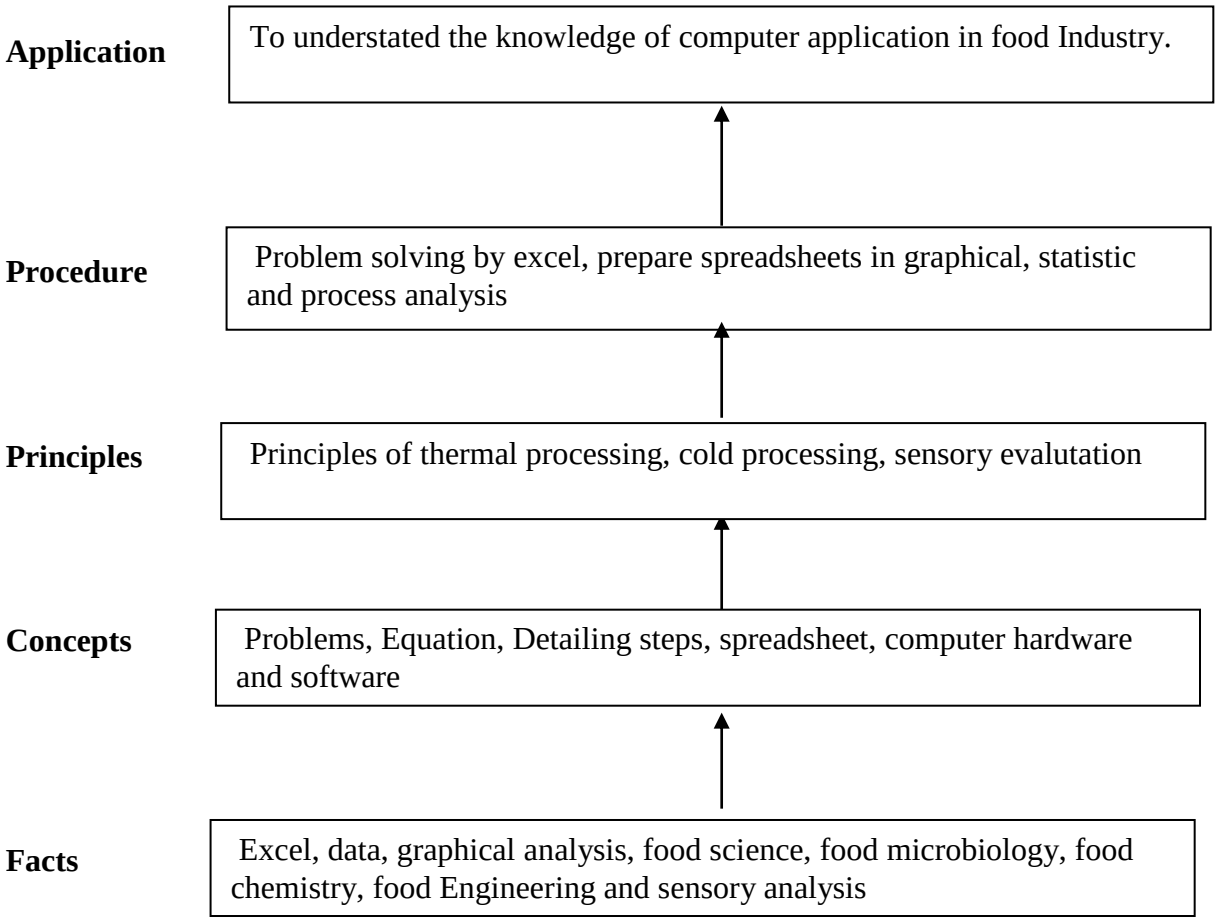
The main objective of introducing this subject in the diploma course of food technology is to expose the student with fundamental knowledge on hardware and software of computers. It will also impart knowledge related to the applications of computation in food industries

Objectives:

Students will be able to:

1) Understand knowledge of hardware and software of computers.
2) Understand spreadsheets in Graphical, Statistical, and Process Analyses.

Learning Structure:



CONTENTS: Theory

Note: Following contents to be covered during practical periods

Name of the Topic	Practical Hrs.
Topic 1: INTRODUCTION **Specific Objectives:** ➢ List various software used in food Industry ➢ State application software in food processing **Contents:** • Introduction to various software for their application in food technology	08
Topic 2: PROBLEMS SOLVING IN FOOD INDUSTRY BY MS-EXCEL **Specific Objectives:** ➢ Solve problems in food industry by computer MS-Excel ➢ Determine D-Value and Z-value by application of MS-excel **Contents:** • Application of MS Excel to solve the problems of Food Technology Microbial distraction in thermal processing of food - Determining decimal reduction time from microbial survival data - Thermal resistance factor, Z-values in thermal processing of food - Sampling to ensure that a lot is not contaminated with more than a given percentage • Statistical quality control - Probability of occurrence in normal distribution - Using binomial distribution to determine probability of occurrence - Probability of defective items in a sample obtained from large lot • Sensory evaluation of food - Statistical descriptors of a population estimated from sensory data obtained from a sample - Analysis of variance * One factor, completely randomized design * For two factor design without replication - Use of linear repression in analyzing sensory data	30
Topic 3: COMPUTER APPLICATION IN FOOD INDUSTRY **Specific Objectives:** ➢ State computer application in food analysis laboratory **Contents:** • Familiarization with the application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants, stating from the receiving of raw material up to the storage & dispatch of finished product	10

Topic 4: COMPUTER AIDED MANUFACTURING **Specific Objectives:** ➢ Describe process control by computer application ➢ List of processing instrumentation and their controlling system by computer. **Contents:** • Basic Introduction to computer aided manufacturing Application of computers in instrumentation and control of food machinery, inventory control, process control etc.	16
Total	**64**

List of Assignments:

1. Introduction to computer.
2. Operating system practice using DOS commands.
3. Problem solving using spread sheet.
4. Use of statistical package for analysis of data.
5. Use of word processing software for creating reports.
6. Familiarization with software related to food industry.
7. Visit to the industries & knowledge of computer application in same.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	R. Paul Singh, AP.	Computer Applications in Food Technology	Academic Press
02	--	Manuals of MS Office	--
03	Greg Perry	MS OFFICE 2000	Techmedia

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Third

Subject Title : Professional Practices - I

Subject Code : 19043

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

Rationale:

Most of the diploma holders work in industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

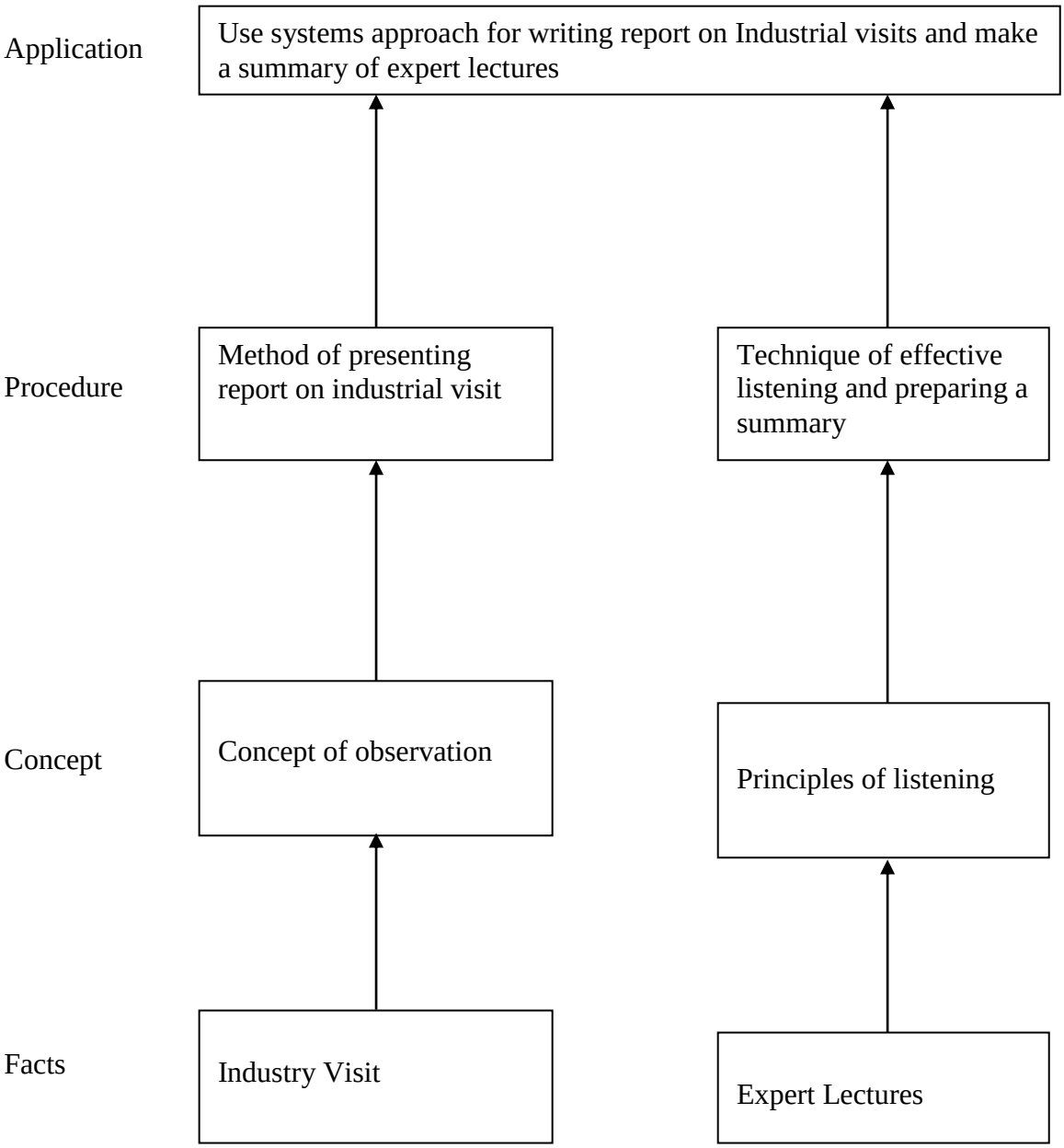
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

The Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Learning Structure:



Activities	Hours
Topic 1: COMPUTER APPLICATION IN FOOD INDUSTRY **Contents:** • Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work. Visits to **any four** of the following i) Fruit & Vegetable Processing Industry ii) Bakery Industry iii) Fermentation Industry iv) Dairy Plant v) Public food analysis laboratory vi) Fish processing plant vii) Food pre-processing plant viii) Food Packaging material production plant ix) Water treatment plaint	18
Topic 2: Expert Lectures and Students seminars **Contents:** • Lectures by Professional / Industrial Expert / Students Seminars based on information search to be organized from any THREE of the following area. The brief report to be submitted on the guest lecturer by each student as a part of Term work. i) Pollution control. ii) Fire hazards and Safety Norms iii) Biotechnology. iv) Food Industry scope. v) FSSAI vi) HACCP vii) Entrepreneurship Development. viii) Packaging Technology. ix) Topics related to Social Awareness such as – Career opportunities, Communication in Industry, Yoga Meditation, Aids awareness and health awareness.	12
Topic 3: Group Discussion: **Contents :** • The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are - i) Sports ii) Social activity iii) Current news items iv) Discipline and House Keeping v) Current topics related to Food Technology field.	08
Topic 4: Student Activities: **Contents** • The students in a group of 3 to 4 will perform **any four** of the following activities (others similar activities may be considered) and submit any two report on the activity as part of Term work. Activity: i) Collecting information from market: Specifications of processing and analytical equipments. ii) Collecting information - ISI-9001,14000 and 22000 Implementation process iii) Collecting information from Industrial safety.	10

iv) Collection and study of FSSAI, AGMARK and ISI standards related to different food products. v) Collection of information required for setting up of food processing unit. vi) Role of MIDC, DIC,MSSIDC vii) Projects submission repot to MFPI- Schemes, Instruction , and process	
Total	**48**

Course Name : All Branches of Diploma in Engineering & Technology

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

Semester : Fourth

Subject Title : Environmental Studies

Subject Code : 17401

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	01	50#*	--	--	25@	75

#* Online Theory Examination

NOTE:

- **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:

Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding. We are today facing a grave environmental crisis. The unceasing industrial growth and economic development of the last 300 years or so have resulted in huge ecological problems such as

overexploitation of natural resources, degraded land, disappearing forests, endangered species, dangerous toxins, global warming etc.

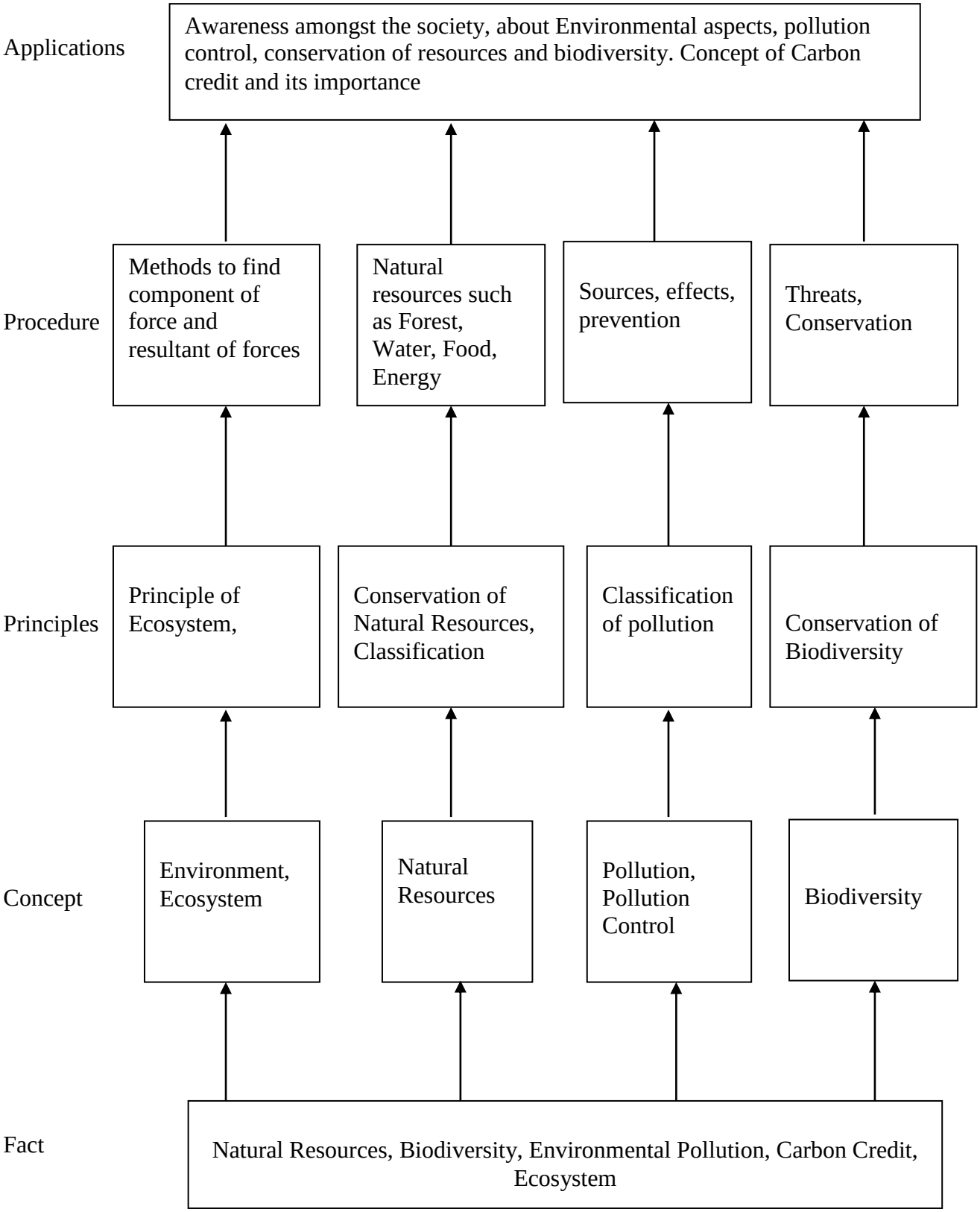
It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, Forests, etc.

General Objectives: The student will be able to**,**

1. Understand importance of environment
2. Know key issues about environment
3. Understands the reasons for environment degradation
4. Know aspects about improvement methods
5. Know initiatives taken by the world bodies to restrict and reduce degradation

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
Topic 1: Nature of Environmental Studies Specific Objectives: ➢ Define the terms related to Environmental Studies ➢ State importance of awareness about environment in general public **Contents:** • Definition, Scope and Importance of the environmental studies • Importance of the studies irrespective of course • Need for creating public awareness about environmental issues	01	04
Topic 2: Natural Resources and Associated Problems Specific Objectives: ➢ Define natural resources and identify problems associated with them ➢ Identify uses and their overexploitation ➢ Identify alternate resources and their importance for environment **Contents:** 2.1 Renewable and Non renewable resources • Definition • Associated problems 2.2 Forest Resources • General description of forest resources • Functions and benefits of forest resources • Effects on environment due to deforestation, Timber extraction, Building of dams, waterways etc. 2.3 Water Resources • Hydrosphere: Different sources of water • Use and overexploitation of surface and ground water • Effect of floods, draught, dams etc. on water resources and community 2.4 Mineral Resources: • Categories of mineral resources • Basics of mining activities • Mine safety • Effect of mining on environment 2.5 Food Resources: • Food for all • Effects of modern agriculture • World food problem	04	10
Topic 3. Ecosystems • Concept of Ecosystem • Structure and functions of ecosystem • Energy flow in ecosystem • Major ecosystems in the world	01	04
Topic 4. Biodiversity and Its Conservation • Definition of Biodiversity • Levels of biodiversity • Value of biodiversity • Threats to biodiversity • Conservation of biodiversity	02	06

Topic 5. Environmental Pollution • Definition • Air pollution: Definition, Classification, sources, effects, prevention • Water Pollution: Definition, Classification, sources, effects, prevention • Soil Pollution: Definition, sources, effects, prevention • Noise Pollution: Definition, sources, effects, prevention	03	08
Topic 6. Social Issues and Environment • Concept of development, sustainable development • Water conservation, Watershed management, Rain water harvesting: Definition, Methods and Benefits • Climate Change, Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust: Basic concepts and their effect on climate • Concept of Carbon Credits and its advantages	03	10
Topic 7. Environmental Protection Brief description of the following acts and their provisions: • Environmental Protection Act • Air (Prevention and Control of Pollution) Act • Water (Prevention and Control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act Population Growth: Aspects, importance and effect on environment • Human Health and Human Rights	02	08
Total	**16**	**50**

Practical:
Skills to be developed:

Intellectual Skills:
1. Collection of information, data
2. Analysis of data
3. Report writing

Motor Skills:
1. Presentation Skills
2. Use of multi media

List of Projects:
Note: Any one project of the following:
1. Visit to a local area to document environmental assets such as river / forest / grassland / hill / mountain
2. Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
3. Study of common plants, insects, birds
4. Study of simple ecosystems of ponds, river, hill slopes etc

Prepare a project report on the findings of the visit illustrating environment related facts, analysis and conclusion. Also suggest remedies to improve environment.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Anindita Basak	Environmental Studies	Pearson Education
02	R. Rajgopalan	Environmental Studies from Crises to Cure	Oxford University Press
03	Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy	Environmental Studies	Wiley India

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fourth

Subject Title : Flesh Food Technology

Subject Code : 19412

Teaching and Examination Scheme:

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

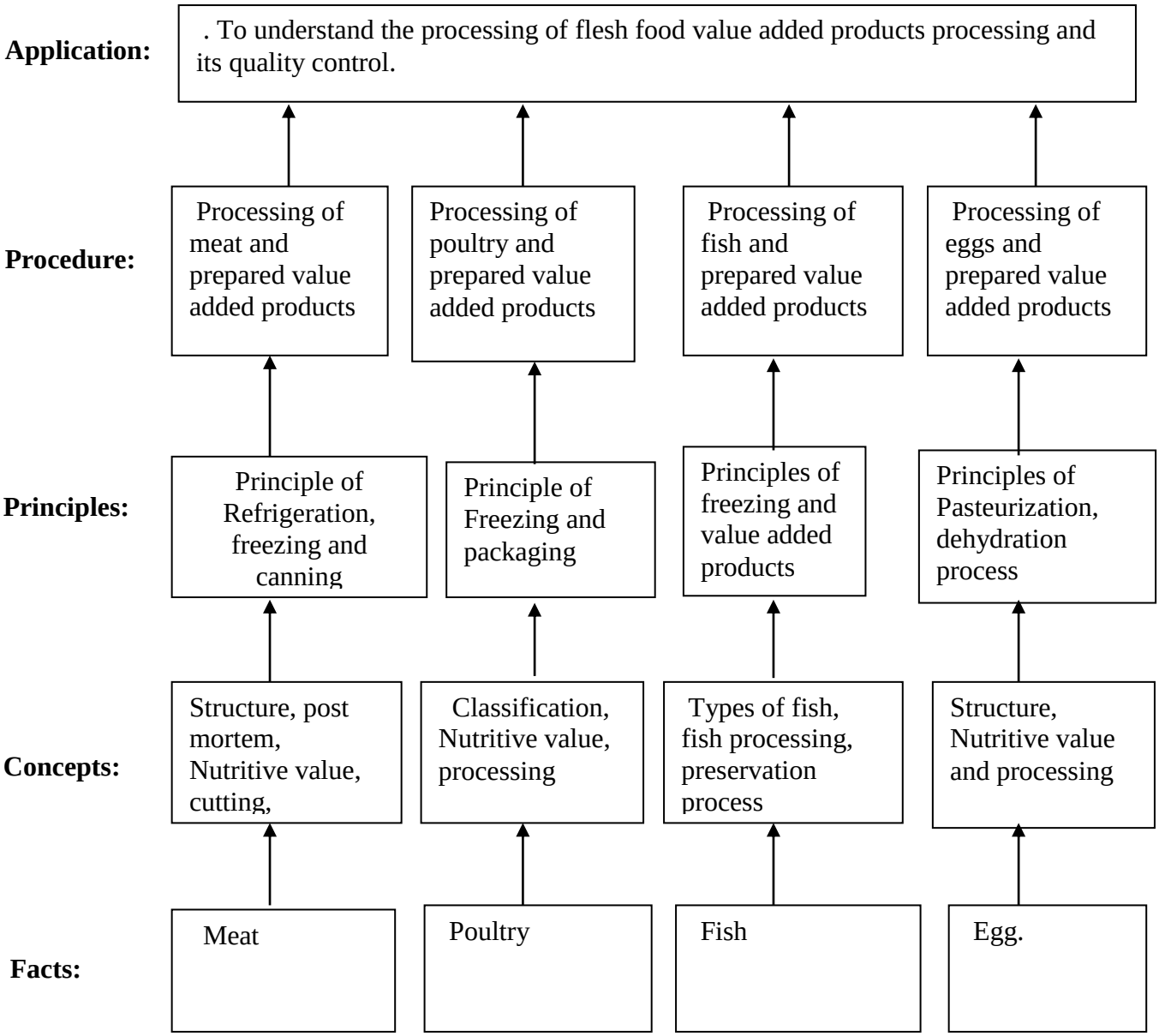
Flesh food is one of the highly perishable foods. The knowledge of process technology of flesh foods is required to cater the need of the large portion of the world population. The flesh food technology is an important branch of food industry involving the processing of foods such as meat, fish, poultry and eggs having high nutritive value. Food technologist is required to have the knowledge of the composition and processing of flesh foods as their demand is increasing rapidly.

General Objectives:

Students will be able to:

- Study processing and preservation of animal foods.
- Understand technology behind preparation of various animal food products and by-product utilization

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: PROCESSING OF MEAT AND MEAT PRODUCTS **Specific Objectives:** ➢ Describe structure and chemical composition of meat ➢ Prepare different value added products. ➢ Describe processing of meat **Contents:** 1.1Chemistry of Meat (Marks-08) • Structure and composition of meat tissues, Cuts and grades of meat, Post mortems changes, Tenderization of meat and ageing 1.2 Processing of Meat (Marks-12) • Pre-slaughter treatment, Slaughtering and related practices • Refrigeration and freezing of meat, thermal processing- canning of meat, retort pouch, dehydration, irradiation • RTE meat products, meat curing. Sausages- processing, types and defects 1.3 Value added meat product (Marks-08) • Burger, patties, pies , By products of meat processing	16	28
Topic 2: POULTRY AND POULTRY PRODUCTS **Specific Objectives:** ➢ Describe chemical composition and process technology of poultry ➢ Prepare different value added products and frozen products **Contents:** 2.1 Chemistry and processing (Marks-14) • Classification, Composition, Nutritive value Poultry processing- slaughter and bleeding, scalding, de-feathering, eviscerating, chilling, packaging 2..2 Value added product (Marks-10) • Tandoor chicken, RTE Products (procedure, flow chart) By Product of poultry processing	16	24
Topic 3: PROCESSING OF FISH AND FISH PRODUCTS **Specific Objectives:** ➢ Describe Nutritive value and processing of Fish ➢ Prepare different value added products and frozen products ➢ Understand Resent technique in Fish processing (surimi process) **Contents:** 3.1Chemistry of Fish (Marks-12) • Types of fish, Composition and nutritive value and Fish spoilage • Processing of Fish Storage of fish –freezing at sea, freezing at land • Principles of canning, classification based on pH groupings, effect of heat processing on fish, storage of canned fish, pre-process operations, post process operations, cannery operations for specific canned products. 3.2 Value added products– (Marks-16) • coated fish products, white fish products, fish cakes and burgers, fish muscle proteins, the surimi process, traditional and modern surimi	16	28

production lines, quality of surimi products, comparison of surimi and fish mince products • Fish protein concentrates (FPC), fish protein extracts (FPE), fish protein hydrolysates (FPH) , processing of shrimps, crabs, lobsters, scampi, mollusks		
Topic 4: PROCESSING OF EGG **Specific Objectives:** ➢ Describe the chemistry of Egg and process of preservation of egg. ➢ State Nutritive value of egg and describe the general management layer house for egg. **Contents:** 4.1 Chemistry of Egg. (Marks-06) • Structure, composition, Nutritive value Quality and storage 4.2 Processing of Egg (Marks-14) • pasteurization, de-sugarization, freezing, dehydrated products, eggs product as emulsifying agents, thickening agents • Egg Industry and Egg Production Practices, General management of a layer house. Preservation of eggs**,** Refrigeration and freezing, thermal processing, dehydration, coating.	16	20
Total	**64**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Understand microbiological testing of different flesh foods.
2. Understand the preservation techniques of flesh foods.

Motor Skills:

1. Prepare of flesh food products.
2. Observ of changes during processing.

List of Practical's:

1. Preparation of value added products of meat /fish/ eggs.
2. Dressing (pre-processing) of fish.
3. Slaughtering of meat / poultry.
4. Estimation of moisture content of meat.
5. Dehydration of meat /poultry/ eggs
6. Roasting and mincing of poultry/ meat / eggs
7. Canning of poultry/ meat / eggs
8. Microbiological testing of meat, fish, poultry and eggs.
9. Evaluation of eggs for quality parameters.
10. Visit to related industries.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	C. P. Mallett	Frozen Food Technology	--
02	Norman Potter	Food Science - 5th Edition	CBS Publisher & Distributor, New Delhi
03	S. Manay	Food Facts and Principles	New Age International (P) Ltd., New Delhi
04	Hall GM,	Fish Processing Technology	VCH Publishers Inc., NY, 1992
05	Sen DP	Advances in Fish Processing Technology	Allied Publishers Pvt. Limited 2005
06	Shai Barbut	Poultry Products Processing	CRC Press 2005
07	Pearson & Gillet	Egg Science and Technology	Egg Science and Technology
08	Lawrie R A, Lawrie's	Meat Science	Woodhead Publisher, England

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fourth

Subject Title : Fermentation Technology

Subject Code : 19413

Teaching and Examination Scheme:

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

Fermentation is one of the oldest methods of food processing. Bread, beer, wine, and cheese originated long before Christ. Although modern food technology has contributed to the present day high standard of quality and hygiene of fermented foods, the principles of the age-old processes have hardly changed. In industrialized societies, a variety of fermented foods are very popular with consumers because of their attractive flavor and their nutritional value

Fermentation technology is an important branch of food industry. Involving the production of various fermented foods, such as alcoholic beverages and yeast production. The technologist is required to have knowledge of these processes and the type of equipment used for these processes. This subject covers major fermentation processes, the equipment used and the quality standard for their production.

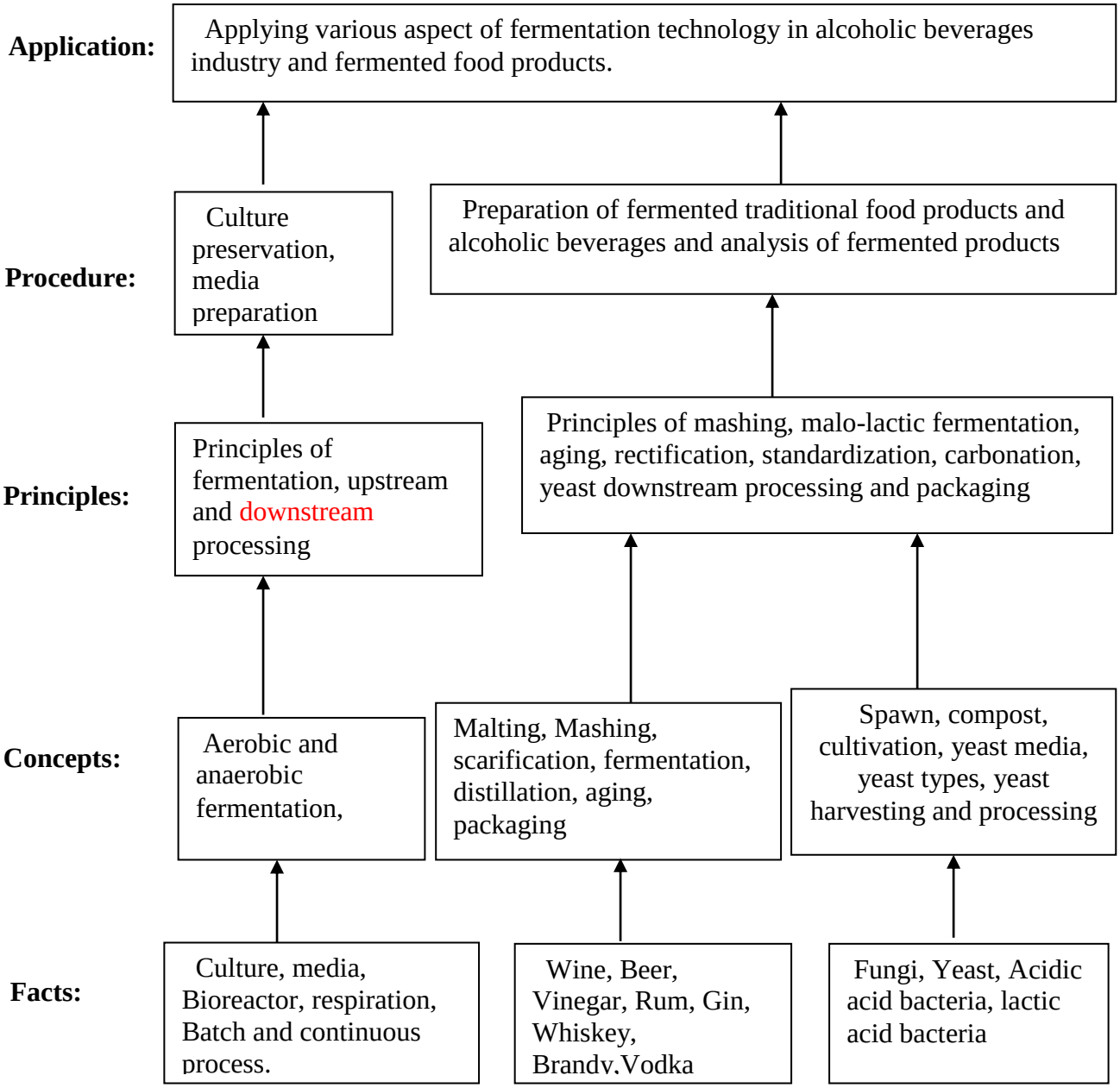
A chapter on mushroom cultivation is included as this is gaining the interest of large number of industrialists.

General Objectives:

Students will be able:

1. Understand the principles of food fermentation technology.
2. Study the types of starters used in Food Industry.
3. Study the production of various fermented foods.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: GENERAL INTRODUCTION **Specific Objectives:** ➢ Define related terms in fermentation. ➢ Describe fermentation process and its utilization in food industry **Contents:** • Definition of fermentation, importance of Fermentation, respiration, anaerobic respiration, Maintenance and preparation of industrially Important cultures • General media used for Fermentation, Sterilization of media, Industrial fermentors and its accessories, Batch and continuous fermentation.	10	14
Topic 2: MUSHROOM CULTIVATION **Specific Objectives:** ➢ Draw flow sheet of spawn and mushroom production. ➢ List raw material and process parameters ➢ Describe production process of mushroom **Contents:** • Introduction, Spawn production, Cultivation of paddy straw, White button and oyster mushroom, Processing problems, contamination and its control	08	12
Topic 3: TRADITIONAL FERMENTED PRODUTS **Specific Objectives:** ➢ Describe process of tradition fermented foods production. ➢ List raw material and process parameters for fermented products. **Contents:** • Cereal base-Idli, Dosa and Dhokla • Fruits and vegetables base- Pickles • Meat and meat products-Pickles and sauces • Legume base-soya sauce • Dairy base-curd and yogurt	08	12
Topic 4: YEAST PRODUCTION AND SINGLE CELL PROTEIN **Specific Objectives:** ➢ Name four yeasts and their application in food processing. ➢ Differentiate between compressed and active dry yeast. ➢ Describe production process of single cell protein. **Contents:** 4.1 Yeast Production (Marks-08) • Types of yeast and their uses, process of manufacturing - media, starter culture, separation of cells, drying, methods of maintenance, preservation and quality control. 4.2 Single cell Protein (Marks-06) • Source, Micro-organism, process, Nutritive value, advantages and Limitation	10	14

Topic 5: BREWING AND VINEGAR **Specific Objectives:** ➢ Define the terms related brewing ➢ State condition of malting, mashing and fermentation ➢ Draw manufacturing process flow diagram of beer and vinegar **Contents:** 5.1 Brewing process (Marks-12) • Process: raw materials and its role, Types of beer • Malting of barley, Mashing, brew kettle boiling, brewing, carbonation, packaging, pasteurization and by products. 5.2 Vinegar process (Marks-06) • Introduction - types of vinegar, mechanism of acetic acid fermentation, processing - slow process, Orlean's process and quick process, downstream processing, defects in vinegar	10	18
Topic 6: WINE PRODUCTION **Specific Objectives:** ➢ Define related terms in wine technology ➢ Draw process flow sheet of wines making. **Contents:** 6.1 Introduction, (Marks-10) • Types of wine, process technology of white wine-grape pre-processing, grape juice treatment, fermentation, malolatic fermentation, clarification, aging, standardization and packaging process. Health benefits of wine 6.2 Wine Production (Marks-06) • Process technology of Red, Rose, fortified and sparkling wine	10	16
Topic 7: DISTILLED ALCOHOLIC BEVERAGES **Specific Objectives:** ➢ Define related terms in wine technology ➢ Draw manufacturing process flow sheet of IMFL **Contents:** • Introduction – common types, culture, raw materials • Whiskey Processing - general process - malting is milling cooking of starch, saccharification, fermentation, distillation, aging, standardization, bottling and byproducts. • Production process of Rum, Brandy, Gin and Vodka (Extra Neutral alcohol, standardization and processing steps)	08	14
Total	**64**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Analyse different fermented products and to compare with specifications.
2. Understand the preservation of cultures and propagation of cells.

Motor Skills:

1. Preparation of fermented products.
2. Observe cultivation of mushroom.

3. Do chemical analysis of wine and vinegar.

List of Practicals:

1. Cultivation of Spawn and paddy mushroom in bags.
2. Preparation of beer.
3. Chemical analysis of beer by using ISI Handbook
4. Preparation of wine.
5. Chemical analysis of wine by using ISI Handbook
6. Chemical analysis of distilled alcoholic beverages by using ISI Handbook)
7. Chemical analysis of vinegar.
8. Preparation of Fermented Tradition food product any two
9. Visit to the winery / brewing / distillery / pickles and mushroom production industry.

Learning Resources
Books:

Sr. No.	Author	Title	Publisher
01	L. E. Casida, Jr.	Industrial Microbiology	New Age International (P) Ltd., New Delhi
02	P. F. Stanbury & A.Whitaker & S. J. Hall	Principles of Fermentation Technology - 2nd Edition	Aditya books Pvt. Ltd., New Delhi
03	Brian J. Wood. Elsiever	Microbiology of Fermented Foods	Volume II and I. Applied Science Publication
04	John Garbutt	Essentials of Food Microbiology	Arnold International Students

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fourth

Subject Title : Food Process Engineering

Subject Code : 19414

Teaching and Examination Scheme:

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

This subject deals with the machinery and equipment which are generally employed the sorting and grading of the raw materials as well as cleaning, grinding, pulping, drying, filling and sealing of raw material and processed foods. Even it also deals with material handling, distillation, crystallization and storage of food. Hence, it is to be taught as well as the practical to be conducted in laboratories with great care to have better understand of the importance of this subject. This subject covers separation processes of foods, heat processing, oil seeds processing, hot beverage processing and confectionery processing.

General Objectives:

Students will be able:

1. Acquaint with fundamentals of food engineering and its process.
2. Understand handling and utilization of machinery and equipment used for food processing.
3. Study preparation of different product by using heat and mass transfer processing equipments.

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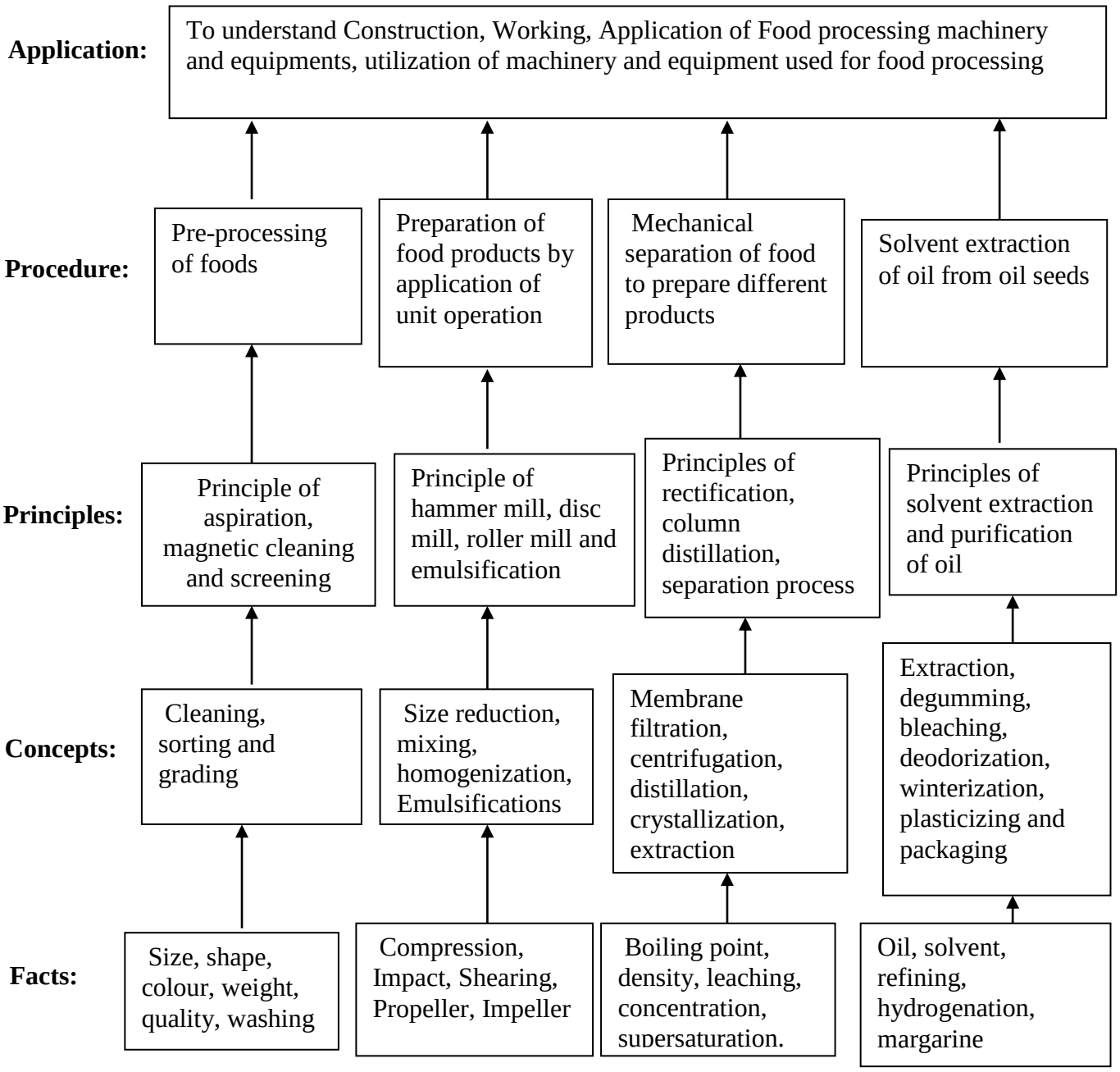
Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: PREPARATION OF FOODS FOR PROCESSING **Specific Objectives:** ➢ Describe methods of raw material cleaning ➢ Give benefits of Sorting and grading of foods ➢ Enlist parameters of sorting and grading parameters, **Contents:** 1.1 Cleaning process : (Marks-06) • Introduction to various raw materials used in food Production, cleaning procedures for raw material, their importance and different methods, equipments and machinery used for cleaning of raw materials. 1.2 Sorting and grading process: (Marks-06) • General consideration, types of sorters and graders- (Color sorter, size sorter, shape sorter, weight sorter.)	08	12
Topic 2: SIZE REDUCTION AND MIXING PROCESS **Specific Objectives:** ➢ State principle of size reduction equipments ➢ Describe construction and working of size reduction equipments ➢ Define the terms in emulsification and mixing unit operations **Contents:** 2.1 Size reduction: (Marks-08) • Principle of size reduction, size reduction equipment (Roller Mills, Hammer Mill, Disc Mills, Colloid Mill, Examples of Size Reduction of Solids in Food Processing) methods of screening. 2.2 Emulsification : (Marks-06) • Emulsifying Agents, Emulsifying equipment, Examples of Emulsification in Food Processing 2.3 Mixing: (Marks-08) • Mixing of Low and Moderate Viscosity Liquids, Mixing of High Viscosity Liquids, Pastes and Plastic Solids, Mixing Dry, Particulate Solids, Applications for Mixing in Food Processing	12	22
Topic 3: MECHANICAL SEPERATION PROCESS **Specific Objectives:** ➢ Define related in mechanical separation process. ➢ Describe construction, working and application of separation process ➢ Differentiate between microfiltration and ultra filtration **Contents:** 3.1 Filtration and centrifugation: (Marks-08) • Filtration, Centrifugation and Gravity separation (equipments, construction, working and application in food Industry) 3.2 Membrane separation: (Marks-08) • Membrane separation, micro filtration, Ultra Filtration and reverse osmosis process technology and its application in food production.	12	16
Topic 4: MASS TRANSFER POERATION IN FOOD INDUSTRY **Specific Objectives:** ➢ State the Principle of mass transfer operation in food Industry ➢ Classify Mass transfer equipments and its use **.**	14	22

➢ Describe construction, working and diagram of mass transfer unit operation. **Contents:** **4.1** Solid-liquid Extraction: : (Marks-08) • Leaching methods, rate and equipment of extraction Single-Stage Extractors, Multistage Bed Extractors, Multistage Moving Bed Extractors Applications of leaching in Food Processing 4.2 Distillation Process: : (Marks-08) • Types of distillation- Simple, rectification, double distillation, steam distillation, column distillation, Applications of Distillation in Food Processing 4.3 Crystallization Process: (Marks-06) • Crystallization equipment and process in food industry		
Topic 5: MATERIAL HANDLING **Specific Objectives:** ➢ List the Principles of material handling in food industry ➢ State types of conveyors and elevators and its application **Contents:** • General consideration, conveying Gravity conveyors Powered conveyors (Roller, Belt, Chain, Screw, Vibrating, Magnetic), elevating and pneumatic equipment	06	10
Topic 6: PROCESSING OF OIL SEEDS **Specific Objectives:** ➢ Define related terms in oil Technology ➢ State Purification techniques of oil and process of purification. **Contents:** 6.1 Production Process of oil: (Marks-10) • Processing technology of oil seeds, Oil seed pressing, Solvent extraction, Purification (degumming, refining, bleaching, deodorization) 6.2 Oil Processing: (Marks-08) • Hydrogenation, plasticizing, tempering, winterization, oil products - Margarine, Shortening, Mayonnaise, and salad dressing	12	18
Total	**64**	**100**

Practical:
Skills to be developed:

Intellectual Skills

1. Understand the principles related to unit operations and unit processes in food industry.
2. Select processing treatment with respect to the type of food.
3. Analyze the properties of food and their processes by employing proper unit operations.

Motor Skills

1. Observe the construction and working by using different unit operations.
2. Handle the equipments.
3. Observe the mass transfer process.
4. Follow procedure while performing the experiment.

List of Practicals:

1. Sorting and grading of fruits, eggs, dals, wheat etc.
2. Preparation of any food product by crystallization process
3. Screen analysis- identification of particle size by screen analysis.
4. Determination of adequacy of blanching process
5. Determination of adequacy of Pasteurization process
6. Distillation of alcoholic liquor and determination of specific gravity of distilled liquors.
7. Preparation of ready to eat food product by application of Size reduction process
8. Preparation of bread, cake, biscuits, ice cream, etc by application of mixing equipments
9. Preparation any Instant / Concentrate/ extract product by using Extraction unit operation
10. Solvent extraction of oil from oil seeds by soxhlet extractor.
11. Preparation of food product by crystallization process.
12. Preparation of fried product potato chips / banana chips
13. Visit to food processing industries.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	McCabe and Smith	Unit operation of Chemical Engineering	McGraw-Hill, Inc., New York
02	T. Sekine & Y. Hasegwa	Solvent Extraction Chemistry	Morcell Dekker
03	Valentas Rotstein Singh	Handbook of Food Engineering Practical	CRC Press, New York
04	P. J. Fellows	Food Processing Technology	Wood head Publishing Ltd., Cambridge
05	G. Subbulakshmi	Food Processing & Preservation	New Age International Publisher
06	B. W. Minifia	Chocolate, Cocoa & Confectionery	CBS Publisher & Distributors, New Delhi

List of Laboratory Equipments:

Sr. No.	Name of Equipment	Technical Specification	Min. Qty./Nos. Required	Remark Make / Model
01	Screening assembly	Set of sieves of 200 mm. dia. & 35 mm. height of each sieve consisting of ISS No. 5 in microns 1700, 850, 600, 425, 300, 212, 106, 75, 53 with lid & receiving pan 2	**01**	
02	Hammer mill / Pulveriser	Maximum Feed Size ¼". Product size100 mesh. Equipment should have heat treated disk 7" in dia. Adjustment mechanism for variable size of product. Drive: 3 phase motor VBelt drive. Start/spot switch for ON/ OFF	**01**	

03	Vacuum Filter	Unit should consist of leaf filter of 1 foot diameter provided with filter media. Vacuum pump for efficient filtration should be provided	**01**	
04	Simple distillation	Packed Column for distillation & hydrodynamics	**01**	
05	High-speed-mixer	High Speed Mixer can mix all types of dough for mass production of bakery products. High speed mixer is the closed type. The mixing process is basically meant to convert flour and other inputs to form mass of dough. Time lost in fermentation is nil as compared to slow speed mixers 2 hrs	**01**	
06	JUICE PRESS (TO EXTRACT JUICE FROM CRUSHED FRUITS)	HYDRAULIC JUICE PRESS is a hand operated unit with a hydraulic pump of capacity 5 tones. This unit is mounted on very heavy base and pillars along with hand crew arrangement. Supplied with TEAK WOOD circular plank held together with stainless steel strips. A thick M.S. base tray lined with S.S. is provided with the unit. It is the most unitable press for extracting juice from apples, pineapples, carrots ginger grapes etc.	**01**	

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fourth

Subject Title : Food Safety and Quality

Subject Code : 19415

Teaching and Examination Scheme:

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

Quality is the ultimate criterion of the desirability of any food product. The overall quality of a food depends on the nutritional and other hidden attributes, and sensory quality as assessed by means of human sensory organs. The absence of nutritional qualities and possible presence of hazardous microbes, environmental contaminants, food toxins and chemical additives cannot be easily judged by the consumer. Governments in many countries protect the interest of the consumer regarding nutritional and hidden attributes by stringent controls to assure good food quality and enactment of food laws regarding inspection, grading packaging and labeling of foods.

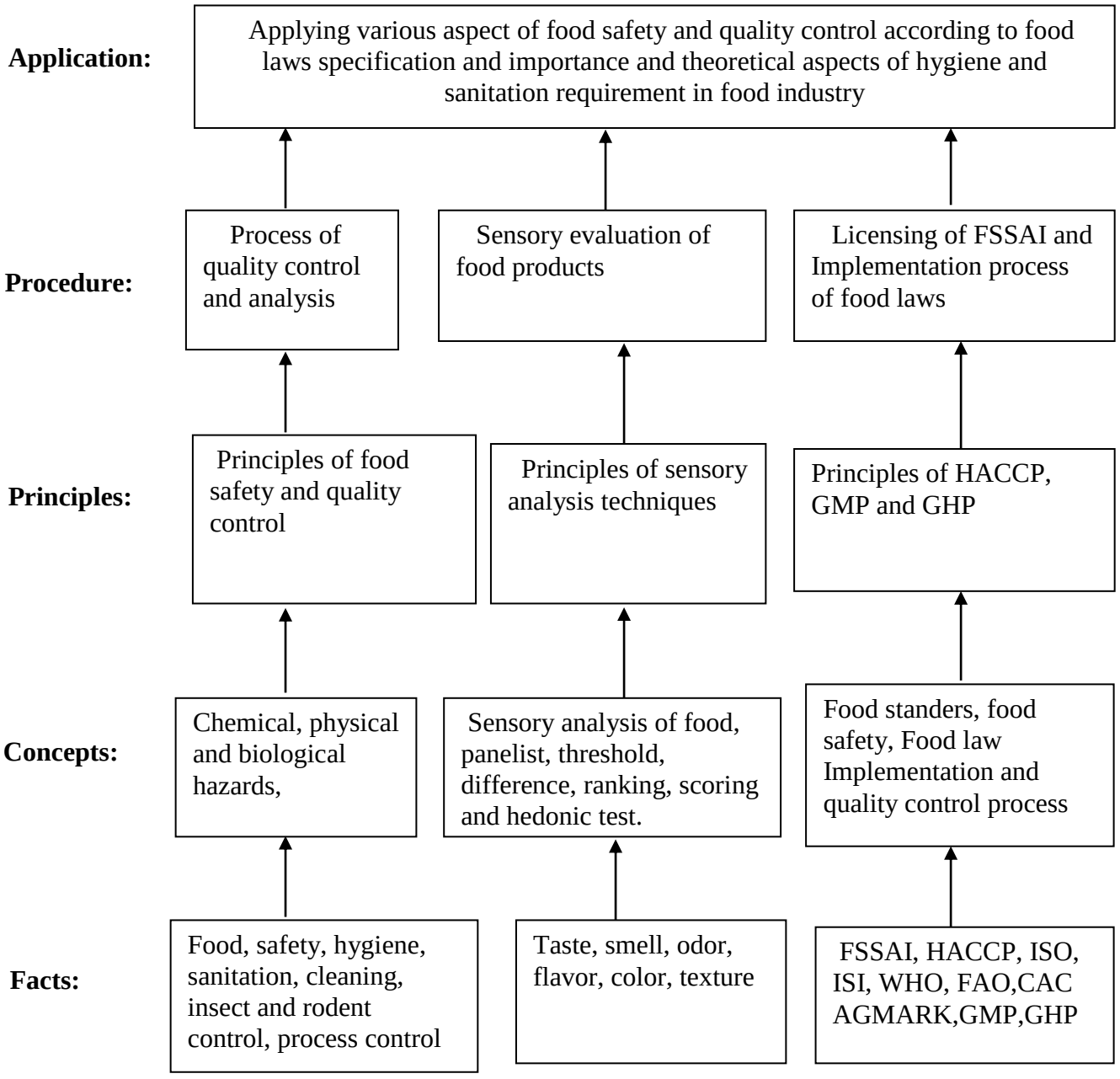
Pure, safe, wholesome food is the minimum expectation of today's consumer. For a food processing company, it is the minimum standard for consumer acceptance. Food technologist must acquire the requisite knowledge of the safest processing methods, plant sanitation practices, waste treatment and disposal and he must apply management skills to insure that this knowledge is continuously applied. This subject covers water treatment, personal hygiene, aseptic processing, plant sanitation, waste treatment and disposal from various food industries.

General Objectives:

Students will be able to:

1. Understand Food safety and hygiene
2. Understand the sanitation practices involved in food industry.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: INTRODUCTION TO FOOD SAFETY **Specific Objectives:** ➢ Define related in Food safety. ➢ State the problems caused by micro-organisms ➢ List chemical, physical and biological hazards **Contents:** • Definition of food safety, Elements of safe food, Sources of food Contamination , Types of micro-organisms and their characteristics, Definition of Cleaning and sanitation, Role of the food Industry and Government in food Safety and control of microbial growth in foods (Marks-10) • Definition, Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Foods (Marks-08)	10	18
Topic 2: FOOD QUALITY **Specific Objectives:** ➢ Describe nutrition quality of food ➢ State mechanical properties of food and its role in processing ➢ Define the terms related mechanical properties **Contents:** • Food Quality-its role in industry, Need of Quality control, Factors affecting quality control. • Nutritional quality (composition of foods), microbial quality, sensory quality viz. color and gloss, size and shapes, flavor, texture, etc. • Mechanical properties of foods viz. viscosity, elasticity, plasticity, consistency, texture etc.	08	16
Topic 3: SENSORY QUALITY EVALUATION **Specific Objectives:** ➢ State purpose of sensory quality evaluation of food ➢ Describe Sensory evaluation techniques **Contents:** • Sensory evaluation of foods, sensory evaluation testing area, testing set up, lighting, preparation of samples, testing schedule, choosing and training panelist, types of panels – trained and consumer panel, Data analysis and interpretation • Sensory testing of foods – Threshold test, difference test, ranking, scoring, hedonic scale consideration for testing	08	20
Topic 4: FOOD LAWS AND REGULATATION. **Specific Objectives:** ➢ Draw flow sheet of licensing procedure of FSSAI ➢ List seven principles of HACCP ➢ Give role and importance of WHO and FAO **Contents** • **FSSAI** -Licensing and Registration process, Documents required, Food safety officer power and duties sanitary, and hygienic requirements, ISI, AGMARK (Marks-08) • **HACCP**- Definition of Hazard and Hazard analysis, Critical limit, CCP, seven Principles of HACCP Identify critical control points,	14	30

Establish the critical limits, Monitor CCPs, Corrective action, Verifying process, HACCP Implementation process in dairy, fruits and confectionery processing. (Marks-10) • **ISO series** (9001, 14000 and 22000) and **GMP** ,GHP& its importance (Marks-06) • World health organization **(WHO),** Food agricultural organization**(FAO), (CAC) Codex Alimentarius Commission**- Information about formation of CAC (Marks-06)		
Topic 5: FOOD STANDARDS **Specific Objectives:** ➢ Give specification of food products as per FSSAI ➢ Compare food quality as per FSSAI specification. **Contents** According FSSAI law- Standards for raw materials, Chemical and bacteriological standards for foods with special reference to • Fruit & vegetable products-Jam, Jellies, pulp, pickles, syrup and juice. • Cereal products-wheat flour, bread, biscuit and cake. • Confectionery products- chocolate and toffee • Milk & milk products-Milk, WMP, SMP, Cheese and Ice-cream. • Meat & poultry products -meat and poultry • Oil and fats- soy-bean, ground nut, vegetable fat and ghee.	08	16
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Analyse of different food product to meet food standard.
2. To carry out the sensory evaluation by different methods.
3. Detect of Food Adulteration.

Motor Skills:

1. List the FPO, PFA, AGMARK, ISI specification of food product.
2. Acquire the analytical technique of different food product.

List of Practicals:

1. Sensory evaluation of food products using following methods
   a) Threshold tests
   b) Difference tests
   c) Ranking
2. Sensory evaluation of food products using following methods
   a) Scoring
   b) Hedonic scale
   c) Preference tests
3. Determination of purity and quality of Water (physical and chemical test) as per FSSAI Standards
4 Determination of purity and quality of frozen / canned product as per FSSAI Standards
5. Determination of purity and quality of Tea / coffee / confectionery products as per FSSAI

Standards

6. Microbiological examination of food samples
7. Microbial analysis of Water
8. Assessment of personal hygiene
9. Identification of CCP ~~point~~ in food Industry (any four food products)
10. Implementation of - HACCP, ISO : 22000

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
01	Rekha S. Singhal & P.R.Kulkarni & Dinanath V.Rage	Handbook of Indices of Food	Woodhead Publishing Ltd., Cambridge
02	Owen, Fred Maidment, Derek eds.	Quality Assurance	Institution of Chemical Engineering
03	Srilakshmi	Food Science	--
04	Vijaya Khader	Textbook of Food Storage and Preservation	Kalyani Publishing, Ludhiyana
05	--	The Prevention of Food Adulteration Act 1954, BARE Act	Akalank Publications, Delhi
06	S. N. Mahindru	Food Safety – A Techno- legal Analysis	Tata McGraw Hill Publishing Co. Ltd., New Delhi
07	David McSwan, Nancy Rue, Richard Linton	Essential of Food Safety and Sanitation	Prentice-Hall Inc., New Jersey
08	Karla Longree, Gertrude Armbruster	Quantity Food Sanitation	John Wiley & Sons, New York
09	David A. Shapton, Norah F. Shapton	Principles and Practices for the Safe Processing of Foods	Butterworth-Heinemann Ltd., Oxford
10	S.C.Rangwala	Water Supply and Sanitary Engineering [Environmental Engineering]	Pradeep Publications, Anand 388 001
11	C.S.Rao	Environmental Pollution Control Engineering	Wiley Eastern Ltd., New Delhi

Websites:

1. www.food.gov.uk › Enforcement and regulation
2. www.carlydunsterlaw.com/what-is-food-law/
3. www.mofpi.nic.in/ContentPage.aspx?CategoryId=147
4. www.foodlaw.org/
5. www.foodlegal.com.au/
6. www.foodsafety.gov
7. www.fightbac.org
8. www.fda.gov
9. www.fsis.usda.gov
10. www.ul.com
11. Foodnet.fic.ca/safety/safety.html

Course Name : Diploma in Food Technology

Course Code : FC

Semester : Fourth

Subject Title : Professional Practices-II

Subject Code : 19060

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

Rationale:

Most of the diploma holders work in industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

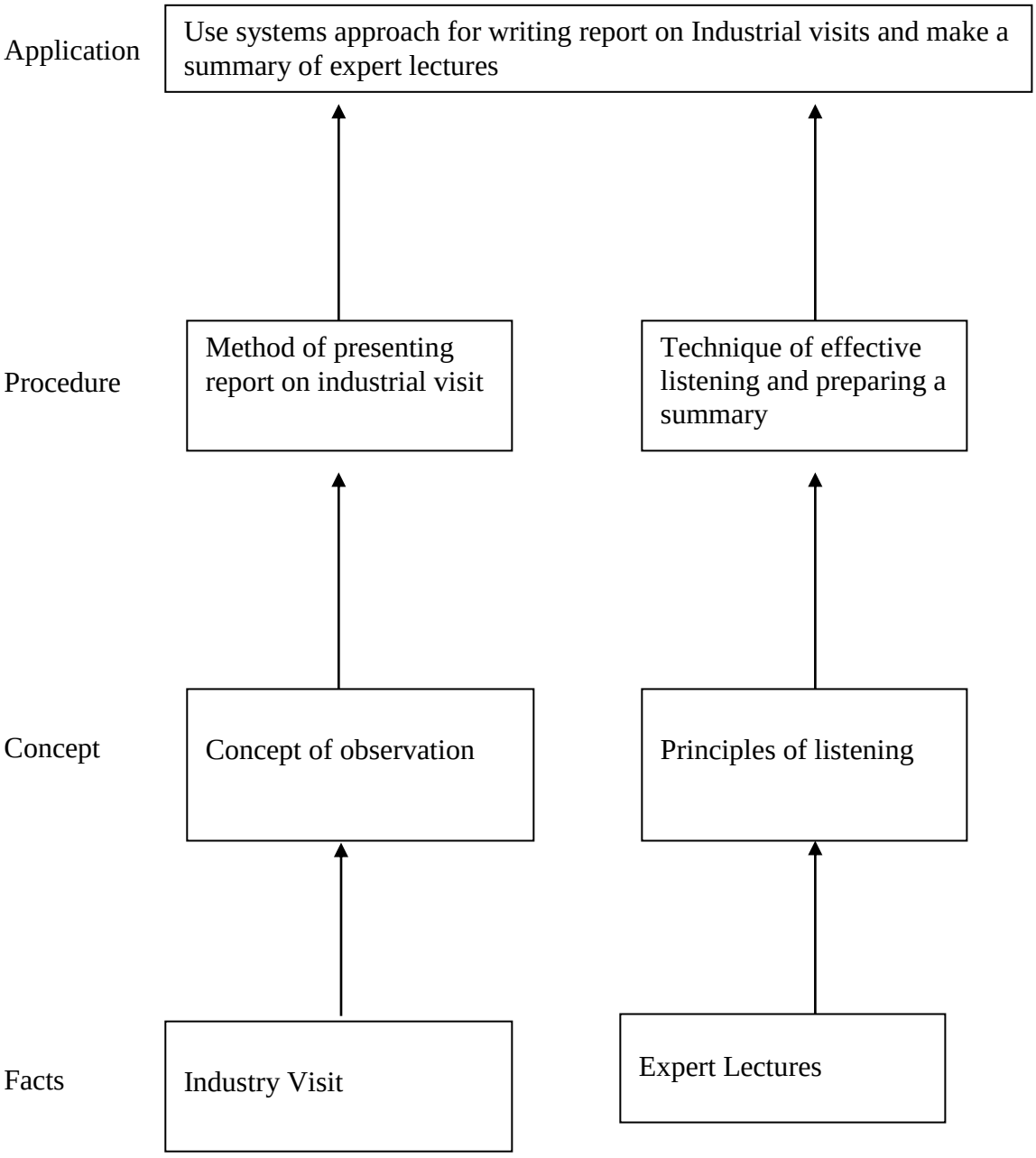
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

General objectives:

The Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Learning Structure:



Contents: Theory

Topic and Contents	Hours
Topic 1: Industrial Visits **Contents:** Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. (**2 visits**) • Following are the suggested types of Industries/ Fields - 1) Cashew nut processing unit. 2) Fish collection and processing unit. 3) Jackfruit / Kokum / Pickles / value added products processing industry. 4) Dairy processing unit. 5) Mango processing unit. 6) Food Packaging material fabrication Industry	14
Topic 2: Contents: Information Search **Contents:** • Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any two topic. • Following topics are suggested : 1) CFTRI Maysor Information search on food project. 2) FSSAI Food Safety standers authority of India 3) MFPI Ministry of food processing Industries 4) NCL Pune Information search on NCL work. 5) FDA .Information search on FDA work. 6) NIN. Information search on NIN work. 7) WHO.Information search on WHO. 8) FAO food agricultural organization 9) Industrial address and information	08
Topic 3: Seminar: (any 2 topics) **Contents:** • Seminar topic should be related to the subjects of fifth semester / topics from guest lectures. • Students shall submit a report of at least 4 to 6 pages and deliver a seminar (Presentation time – 15 minutes for Individual students)	08
Topic 4: Mini Projects: (in a group of 2-3 students) **Contents:** • Prepare mini project and submit report as part of Term work. • Prepare different recipes of food product (Fruits product, confectionary, dairy and bakery product.) • Factory layout on food processing. • Collection of address of supplier of additives / food processing equipments / food analysis equipments • Collection of address of supplier of various food packaging materials • Collection of specification food products as per FSSAI	10
Topic 5: Student Activities **Contents:** • The students in a group of 3 to 4 will perform **any one** of the following activities (others similar activities may be considered) and submit any two report on the activity as part of Term work. Activity: 1. Collection of data regarding loan facilities or other facilities available	08

through different organizations / banks to budding entrepreneurs 2. Survey and interviews of successful entrepreneurs in near by areas 3. Survey of opportunities available in thrust areas identified by Government. 4. Building of Biodata 5. Interview techniques.	
Total	**48**

Websites:

1. www.cftri.com
2. www.woodheadpublishing.com
3. www.dairyscience.com
4. www.nin.india
5. www.ifst.org
6. www.foodtechnologyshow.com
7. www.springer.com