

COURSE CURRICULUM AND SCHEME OF EXAMINATION

Under Choice Based Credit System

**For B.Sc. (Food Science and Technology)
For batch 2019-2022 (3rd to 6th Semester)**

**Department of Food Science and Technology
University College
Chaudhary Devi Lal University Sirsa-125055**

B. Sc. Food Science and Technology (3rd Semester)									
Sr. No.	Course ID	Subject	Type	Credits	Contact Hours per week	Internal Assessment (IA)*	External Exam	Maximum Marks	Duration of Exam (hours)
1.	BFST-301	Food Microbiology	CC	4	4	30	70	100	3
2.	BFST-302	Technology of Fruits & Vegetables	CC	4	4	30	70	100	3
3.	BFST-303	Lab-VII Food Fermentation Technology	SEC	2	4	00	50	50	6: Two session of 3 Hrs. each
4.	BFST-304	Lab-VIII Food Microbiology	CC	2	4	00	50	50	6: Two session of 3 Hrs. each
5.	BFST-305	Lab-IX Technology of Fruits & Vegetables	CC	2	4	00	50	50	6: Two session of 3 Hrs. each
6.	BFST- 306A	Technology of Egg, Poultry & Meat	EC (Any One)	4	4	30	70	100	3
	BFST- 306B	Confectionary & Sugar Technology		4	4	30	70	100	3
7.	BFST-307A	Lab-X Technology of Egg, Poultry & Meat	EC (Any One)	2	4	00	50	50	6: Two session of 3 Hrs. each
	BFST-307B	Lab- X Confectionary & Sugar Technology		2	4	00	50	50	6: Two session of 3 Hrs. each
Total				20	28	90	410	500	

*IA = 30 Marks (20-Midterm examination; 5-Assignment hand written; 5-Attendance)

B. Sc. Food Science and Technology (4th Semester)									
Sr. No.	Course ID	Subject	Type	Credits	Contact Hours per week	Internal Assessment (IA)*	External Exam	Maximum Marks	Duration of Exam (hours)
1	BFST-401	Technology of Milk & Milk Products	CC	4	4	30	70	100	3
2	BFST-402	Food Packaging	CC	4	4	30	70	100	3
3.	BFST-403	Lab-XI Food Product Development	SEC	2	4	00	50	50	6: Two session of 3 Hrs. each
4.	BFST-404	Lab-XII Technology of Milk & Milk Products	CC	2	4	00	50	50	6: Two session of 3 Hrs. each
5.	BFST-405	Lab-XIII Food Packaging	CC	2	4	00	50	50	6: Two session of 3 Hrs. Each
6.	BFST- 406A	Food Plant Hygiene & Sanitation	EC (Any One)	4	4	30	70	100	3
	BFST- 406B	Basic Concepts of Nutrition		4	4	30	70	100	3
7.	BFST-407A	Lab-XIV Food Plant Hygiene & Sanitation	EC (Any One)	2	4	00	50	50	6: Two session of 3 Hrs. Each
	BFST-407B	Lab- XIV Basic Concepts of Nutrition		2	4	00	50	50	6: Two session of 3 Hrs. Each
Total				20	28	90	410	500	

*IA = 30 Marks (20-Midterm examination; 5-Assignment hand written; 5-Attendance)

B. Sc. Food Science and Technology (5th Semester)

Sr. No.	Course ID	Subject	Type	Credits	Contact Hours per week	Internal Assesment (IA)*	External Exam	Maximum Marks	Duration of Exam (hours)
1	BFST-501	Food Safety & Food Laws	CC	4	4	30	70	100	3
2.	BFST-502	Food Engineering	CC	4	4	30	70	100	3
3.	BFST-503	Entrepreneurial Development	SEC	2	2	20	30	50	6: Two session of 3 Hrs. each
4.	BFST-504	Lab-XV Food Safety & Food Laws	CC	2	4	00	50	50	6: Two session of 3 Hrs. each
5.	BFST-505	Lab-XVI Food Engineering	CC	2	4	00	50	50	6: Two session of 3 Hrs. each
6.	BFST-506A	Food Additives	EC (Any One)	4	4	30	70	100	3
	BFST-506B	Food Grain Storage		4	4	30	70	100	3
7.	BFST-507A	Lab-XVII Food Additives	EC (Any One)	2	4	00	50	50	6: Two session of 3 Hrs. each
	BFST-507B	Lab-XVII Food Grain Storage		2	4	00	50	50	6: Two session of 3 Hrs. each
Total				20	26	110	390	500	

*IA = 30 Marks (20-Midterm examination; 5-Assignment hand written; 5-Attendance)

B. Sc. Food Science and Technology (6th Semester)

Sr. No.	Course ID	Subject	Type	Credits	Contact Hours per week	Internal Assesment (IA)*	External Exam	Maximum Marks	Duration of Exam (hours)
1.	BFST-601	Nutraceuticals & Functional Foods	CC	4	4	30	70	100	3
2.	BFST-602	Food Analysis & Instrumentation	CC	4	4	30	70	100	3
3.	BFST-603	Home Based Food Business Development	SEC	2	2	20	30	50	6: Two session of 3 Hrs. each
4.	BFST-604	Lab-XVIII Nutraceuticals & Functional Foods	CC	2	4	00	50	50	6: Two session of 3 Hrs. each
5.	BFST-605	Lab-XIX Food Analysis & Instrumentation	CC	2	4	00	50	50	6: Two session of 3 Hrs. each
6**	BFST-606	Food Plant Layout	EC (both BFST-606 & 607 or only BFST-608)	4	4	30	70	100	3
	BFST-607	Lab-XX Food Plant Layout		2	4	00	50	50	6: Two session of 3 Hrs. each
	BFST-608	Research Project		6	8	30	120	150	
Total				20	26	110	390	500	

*IA = 30 Marks (20-Midterm examination; 5-Assignment hand written; 5-Attendance)

**Research Project (BFST-608) of credit six is optional in place of one elective theory and one elective practical subject (i.e., BFST-606 & BFST-607 of 4 + 2 = 6 credits).

CC: Core Course, EC: Elective Course, SEC: Skill Enhancement Course.

BFST-301 Food Microbiology

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Introduction- Origin of food microbiology as science, general features and importance of different groups of bacteria, yeasts and molds in foods.

Food as nutrient for various microorganisms, factor affecting the growth and survival of microorganisms in foods.

UNIT-II

Methods for microbial examination of foods - Traditional, non-traditional and rapid methods for the microbial examination of food and food products.

Fermentation-definition and types, microorganisms used in food fermentations, fermented foods, types, methods of manufacture for vinegar, sauerkraut, beer, and wine.

UNIT-III

Food Spoilage- Microbial and biochemical aspect of food spoilage, role of bacteria, yeast and molds in food spoilage.

Spoilage of cereal and cereal products, fruits and vegetables, meat and meat products, milk and milk products, fish and fish products, spoilage of egg and poultry and heated canned foods.

UNIT-IV

Food borne Diseases: Types, food borne infections, food borne intoxications.

Bacterial food intoxications: Origin, symptoms, and prevention of food borne disease caused by *Staphylococcus aureus*, *Clostridium botulinum*.

Bacterial food infections: Origin, symptoms, and prevention of bacterial food infections caused by *Salmonella*, *E. coli*, and *Listeria monocytogenes*.

Books Recommended:

Frazier WC and Westoff DC "Food Microbiology" 4th edition Tata Mcgraw-Hill Publishing
Jay JM "Modern Food Microbiology" 3rd edition CBS Publishers and distributors Delhi
1987

Adams MR and MossMO "Food microbiology" New Age International (P) Ltd. 1996
Gunasekaran P. "Laboratory Manual in Microbiology", New Age International (P) Ltd.
1996.

BFST-302 Technology of Fruits & Vegetables

Credits: 4

Periods per week: 4 Hrs.

Duration of exam: 3 Hrs

Max. Marks: 100

Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Classification, chemical composition and nutritive value of fruits and vegetables.

Preparing fruits and vegetables for processing-washing, sorting, grading, peeling, blanching, cutting, destoning and pitting.

UNIT-II

Fruits beverages: Introduction, types, processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification).

Preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation)

Processing of squashes, cordials, nectars, concentrates and powder.

UNIT-III

Fruit processing: Preparation methods of jam, jelly, marmalades, preserve candied and crystallized fruits.

Pickles: Processing, types, causes of spoilage in pickling.

Tomato processing: Tomato juice, puree, paste, chutney, sauce, soup and ketchup.

UNIT-IV

Canning and bottling of fruits and vegetables: Selection of fruits and vegetables, process of canning, factors affecting the process-time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods.

Books Recommended:

Preservation of fruits and vegetables by GirdhariLal, Sidappa G S and Tandon G L, 1960, ICAR, New Delhi.

Food facts & principles by ShanuntalaManay N &Shadoksharaswamy N, 1996, New Age World Publisher, CA.

Food Science by Potter, N.N., CBS Publisher, New Delhi

Skill Enhancement Course

BFST-303-Lab-VII Food Fermentation Technology

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

1. Food fermentation technologies.
2. Study of a bio-fermentor – its design and operation, downstream processing and product recovery.
3. Starter cultures
4. Production of Baker's Yeast
5. Production of yoghurt
6. Development of a fermented food/drink utilizing plant products /animal products or by products as substrate

BFST-304 Lab-VIII Food Microbiology

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

1. Sterilization and disinfection of equipment used in food microbiology laboratory.
2. Preparation of media, slant and broths required in the microbial analysis of foods.
3. To count the number of microorganisms by direct microscopic count method.
4. Study of different types of microorganism colony shapes on agar plates.
5. Study of the capsular and spore staining methods.
6. Isolation of fungi from food materials.
7. Study of incubation test of heated canned foods.
8. Study of dye reduction test of milk.
9. Microbiological analysis of egg, cereal product and fruit product.

BFST-305 Lab-IX Technology of Fruits &Vegetables

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

1. Preparation of fruit juice.
2. Preparation of squashes.
3. Preparation of jam, jellies, marmalade.
4. Preparation of potato chips.
5. Preparation of pickles- sweet and sour.
6. Dehydration and sun-drying of fruits and vegetables.
7. Preparation of tomato puree, paste and ketchup.
8. Organoleptic evaluation of fruits and vegetable products.
9. Visit to food industry.

BFST-306A Technology of Egg, Poultry & Meat

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Structure and composition of egg, nutritive value, interior qualities, grading, handling, packaging, storage, transportation.

Functional properties of eggs, freezing, pasteurization, de-sugarization, dehydration.

UNIT-II

Poultry processing: Types of poultry (Hen, Turkey, Ducks, Geese), chemical composition and nutritive value of poultry meat.

Poultry dressing, slaughtering methods, preservation and packaging of poultry meat.

UNIT-III

Meat processing: Scope of meat processing industry in India, structure, composition & nutritive value of meat.

Classification of meat: Mutton, pork and sheep, meat quality parameters, meat color, water holding capacity, marbling, firmness and factors affecting it.

UNIT-IV

Meat tenderization: Methods of tenderization (natural & artificial), factors affecting tenderness.

Mechanical deboning of meat, restructured meat products, intermediate moisture meats, meat by-products, fermented meat sausages.

Books Recommended:

1. The Meat We Eat by Romans. JR and Costello WJ, Carlson WC, Greaser ML and Jones KW, 2004, Interstate Publishers, USA.
2. Meat Science & Applications by Y.H.Hui, Wai-Kit Nip, Robert W. Rogers and Owen A. Young
3. Egg Science and Technology by Stadelman WJ, and Cotterill OJ, 2002, CBS Publishers, New Delhi.
4. Poultry Meat and Egg Production by Parkhurst C. and Mountney GJ, 2002, CBS Publishers, New Delhi.

BFST-306B Confectionary & Sugar Technology

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Cocoa beans and production; microbial and chemical changes occurring during fermentation; drying, storage and transportation of cocoa beans.

Processing of cocoa beans: cleaning, roasting and winnowing; grinding of nib, production of cocoa butter and cocoa powder.

UNIT-II

Chocolate: Ingredients-crystalline and amorphous sugar; lactose, glucose and fructose; milk and other dairy ingredients.

Sugar confectionary: Types of sugar- production, storage, alternative bulk sweeteners, corn syrup and glucose syrup, sorbitol, xylitol, maltitol, isomalt, lactitol, mannitol, polydextrose.

UNIT-III

Fondant-structure and manufacturing, remelting and casting of fondant. Hard Boiled candy-formulation, ingredients, syrup cooking, forming, pulled sugar, aerated boiling, marsh mallows, naugat.

Hard and soft boiled sugar confectionary: Frappe, caramel, toffee, butterscotch and fudge: formulation and manufacturing process.

UNIT – IV

Jellies and gums- Formulations and ingredients, manufacture process, hard and soft panning, spoilage problems, fat and sugar bloom- causes and preventions.

Chewing gum and bubble gum-Ingredients and manufacturing process.

Recommended Books:

1. Chocolate, Cocoa and Confectionary: Science & Technology by Minifie, 1997, AVI Publishing Co., New York.
2. Handbook of Cane Sugar Technology by Mathur RBL, 1986, Oxford & IBH Publishing Co., New Delhi.
3. The Science of Cookie & Cracker Production by Faridi H., 1994, Chapman & Hall, UK.
4. The Science of Sugar Confectionary by W.P. Edwards, RSC Publishers.
5. The Science of Chocolate by StephentBecett, RSC Publisher.
6. Chocolate, Cocoa and Confectionary Science and Technology by Bernard W. Minifie.

BFST-307A Lab-X Technology of Meat, Poultry & Egg

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

1. Estimation of moisture content of meat
2. Cut out analysis of canned meats/retort pouches
3. Estimation of protein content of meat
4. Analysis of frozen meat/meat emulsion products
5. To study shelf-life of eggs by different methods of preservation
6. Evaluation of eggs for quality parameters (market eggs, branded eggs)
7. To perform freezing of yolk/albumen
8. Meat/Egg product formulation

BFST-307B Lab-X Confectionary & Sugar Technology

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

1. Determine the effect of heat on sugar solution and perform the thread and cold water test.
2. To study the process of inversion, melting and caramelization in sucrose.
3. Preparation of amla candy, fudge and brittles.
4. Preparation of shakarpara and chenna murki.
5. Preparation of candy and toffee and to perform quality assessment tests.
6. Preparation of icing and other cake decorations.

BFST-401 Technology of Milk & Milk Products

Credits: 4

Periods per week: 4 Hrs.

Duration of exam: 3 Hrs

Max. Marks: 100

Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Milk: Definition, composition of milk, important characteristics of major constituents of milk i.e. milk fat, milk proteins, lactose and minerals and minor constituents of milk.

Physical, chemical and nutritive properties of milk, factors affecting the quality and quantity of milk produced by milch animals.

UNIT-II

Market Milk: Brief introduction to Standard milk, Toned milk, Double toned milk, Flavoured milk, Vitamin enriched milk, Reconstituted milk and recombined milk.

Milk Processing: Straining, filtration and clarification, standardization: definition of standardization, purpose and uses of standardization process, use of Pearson's square method to solve the standardization problems in dairy industry.

UNIT-III

Homogenization: Definition, Effect of homogenization on milk. Uses of homogenization, Pasteurization: Definition, purposes and objects of pasteurization—LTLT and HTST processes of pasteurization.

Sterilization: Definition, Method for manufacturing sterilized flavoured milk, UHT process.

UNIT-IV

Adulteration of milk: Types of adulterations, methods of detections of adulterants.

Common preservatives used in milk and their detection, legal and ISI standards of milk

Recommended Books:

Outlines of Dairy Technology by Sukumar De, 1980, Oxford University Press, UK.

Milk & Milk Products by Eckles, Combs, Henery C, and Willes C, 1997, Tata McGraw Hill Publishers, USA.

Principles of Dairy Processing by Warner JN, 1976, Wiley Science Publishers, USA.

BFST-402 Food Packaging

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Packaging Technology: Definitions and functions of packaging, Properties of packaging material in relation to these functions.

Package design: Types of containers-primary and secondary. Package labeling and food safety.

UNIT-II

Packaging materials:

Paper and paper board- structure, making, properties, types (kraft, bleached and greaseproof) and uses of paper and paper board.

Wood-structures, types, properties and wooden containers used in packaging, types of wooden boxes.

UNIT-III

Plastic containers-bottles, cans, jars, cups, tubes, cartons, retort pouch and laminates, biodegradable plastics.

Metals-Properties of metals, different metals used in food packaging, formation of two piece and three piece cans.

UNIT-IV

Aseptic packaging of foods: Sterilization of packaging materials, food contact surfaces, and aseptic packaging system.

Modified atmosphere packaging: Principles, gases used in MAP, equipment for MAP, microbiology of MAP, applications of MAP.

Recommended Books

Food Packaging Materials – M. T. Crosby.

Food Packaging Materials – M. Mahadevish R.V. Gowramma.

Food Packaging – Stanley Sacharow

Food Packaging –Principles & Practices - Gordon L. Robertson

A Handbook of Food Packaging, Frank – A – Paine, Heather Y. Paine

SKILL ENHANCEMENT COURSE

BFST-403 Lab-XI Food Product Development

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

Definition, Importance, objectives & need of product development, reasons of failure, types and steps of product development, product development tools and their use.

Projects on:

1. Market and literature survey to identify the concepts of new products based on special dietary requirements, functionality, convenience and improvisation of existing traditional Indian foods.
2. Screening of product concept on the basis of techno-economic feasibility.
3. Development of prototype product and Standardization of formulation process.
4. Proximate Analysis of New Product
5. Packaging, labelling and shelf-life studies
6. Cost analysis and Final Project Report

BFST-404 Lab-XII Technology of Milk & Milk Products

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

1. Sampling equipment and sampling of milk.
2. Platform tests (Acidity, COB and Alcohol test).
3. Organoleptic Tests.
4. Determination of milk fat percentage by Gerber's method.
5. Determination of specific gravity by lactometer.
6. Determination of SNF percentage and TS percentage of milk with lactometer.
7. Detection of common adulterants and preservatives of milk.
8. Reporting on the suitability of milk for heat processing.
9. Reporting on the quality of given sample of milk.
10. Visit to milk processing plants/NDRI, Karnal.

BFST-405 Lab-XIII Food Packaging

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

1. Identification of different types of packaging materials.
2. To determine basis weight of paper and paper board.
3. To determine thickness of paper and paper board.
4. Shelf life studies of packaging foods.
5. To determine grease resistance of packaging materials.
6. To see the chemical resistance of packaging material.
7. Determination of water vapour transmission rate of various packaging materials.
8. To determine Cobb's value of a paper board.
9. To find out the uniformity and amount of wax on wax paper.
10. To determine the thermal shock resistance of a glass container.
11. Visit to various industries, dealing with food packaging materials like / paper, board and metal cans.

BFST-406A Food Plant Hygiene & Sanitation

Credits: 4

Periods per week: 4 Hrs.

Duration of exam: 3 Hrs

Max. Marks: 100

Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

General principles of food hygiene, personal hygiene of food handlers-habits, clothes, illness, education of handler in handling and service.

Food plant sanitation-Principles & methods, control and inspection.

UNIT-II

Cleaning agents (detergents and Sanitizers) and disinfectants.

Cleaning methods-sterilization, disinfection, heat and chemicals, chemical tests for sanitizer strength.

UNIT-III

Control of infestation, rodent control, vector control, use of pesticides.

Hygiene of water used for processing, potable water supply and its quality standards.

Planning and implementation of training programmes for health personnel.

UNIT-IV

Sanitation in fruits & vegetables industry, cereals industry, dairy industry, meat, egg and poultry units.

Planning and implementation of training programmes for food handlers and health personnel, recommended international code of hygiene for food products.

Recommended books:-

1. Principles of Food Sanitation by Marriott, 5th ed., 2006, CBS Publisher, New Delhi.
2. Hobbs, B. C. and R. J. Gilbert Food Poisoning and Food Hygiene, 4th edition The English Language Book Society and Edward Arnold.
3. Longree K. (1967), Quantity Food Sanitation, Inter science Publishers, New York.
4. Kawata, K. (1963) Environmental Sanitation in India, Lucknow Publisher, New York.
5. Principles of food sanitation –II Edition, AVI Book, Van Nostrand Reinhold, New York

BFST-406B Basic Concepts of Nutrition

Credits: 4

Periods per week: 4 Hrs

Duration of exam: 3 Hrs

Max. Marks: 100

Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Definition, scope and history of nutrition, water balance and energy balance.

Functions of food, food types and groups, energy value of carbohydrates, fats and proteins.

UNIT-II

Body mass index and Basal metabolic rate: basic concept and affecting factors, balanced diet, functional foods and protein energy malnutrition problems.

Functional foods, role in controlling various diseases.

UNIT-III

Recommended daily allowances and requirement of infants, children, adults, old people, Athletes, expectant and nursing mothers.

Diet surveys and diet groups, food exchange list.

UNIT-IV

Importance of therapeutic nutrition, deficiency diseases and disorders of metabolism.

Planning of diets for patients suffering from anemia, diarrhea, diabetes, and cardiac diseases.

Recommended Book:

1. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd Edition. Oxford and IBH Publishing Co. Pvt. Ltd.
2. Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd.
3. Srilakshmi, (2005), Dietetics, Revised 5th edition. New Age International Ltd.
4. Wardlaw MG, Paul M Insel Mosby 1996). Perspectives in Nutrition, Third Edition.
5. Codex Guidelines on Nutrition Labelling (CAC/GL 2_1985) (Rev.1_1993). Rome, Food and Agriculture Organisation of the United Nations / World Health Organisation, 1993.
6. Food Safety and Standards Authority of India portal, Government of India
7. Gopalan, C., (1990). NIN, ICMR. Nutritive Value of Indian Foods.
8. Seth V, Singh K (2005). Diet planning through the Life Cycle: Part 1. Normal Nutrition. A Practical Manual, Fourth edition, Elite Publishing House Pvt Ltd.

BFST-407A Lab XIV Food Plant Hygiene & Sanitation

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

1. Preparation of different types of media (complex, differential and selective)
2. Enumeration of aerial microflora using PDA
3. Assessment of surface sanitation by swab and rinse method
4. Assessment of personal hygiene
5. Study of waste water treatment system/ETP.
6. Design and layout of cold storage and warehouse.
7. Determination of physico-chemical properties of wastewater.
8. Preparation of a sanitation schedule for food preparation area.

BFST-407B Lab-XIV Basic Concepts of Nutrition

Credits: 2

Periods per week: 4Hrs.

Duration of exam: 6 Hrs.

Max. Marks: 50

1. Identification of food sources for various nutrients using food composition tables.
2. Record diet of self using 24 hour dietary recall and its nutritional analysis.
3. Introduction to meal planning, concept of food exchange system.
4. Planning of meals for adults of different activity levels for various income groups.
5. Planning of nutritious snacks for different age and income groups.
6. Preparation of nutritious snacks using various methods of cooking.
7. Nutritional labeling of food products.
8. Estimation of BMI and other nutritional status parameters.

BFST-501 Food Safety & Food Laws

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Introduction to food safety

Definition, Historical background of food safety, Factors affecting Food Safety, Importance of Safe Foods.

Food hazards of physical, chemical and biological origin

Introduction, Physical hazards with common examples, Chemical Hazards (naturally occurring environmental and intentionally added and contaminants due to processing), Seafood and Shell fish poisoning, Microbiological hazards (Bacterial and Fungal).

UNIT-II

Introduction to food acts, laws and standards

Food safety and standard act, prevention of food adulteration act, legal Metrology Act, Fruit product Order, Meat Food Product Order, Milk and Milk Products Regulations, Indian Standards, Agmark Standards.

International Standards: Codex Standards, ISO Standards.

UNIT-III

Food safety management tools

Prerequisites of food hygiene - GHPs, GMPs, HACCP, TQM – concept and need for quality, Microbiological tests for food safety related to (*Coliforms, Listeria, Staphylococci and Salmonella*), definition and principles of risk analysis.

Steps involved in implementation of food safety programme. New approaches and advancements in food safety.

UNIT-IV

Regulatory agencies: Food Safety and Standards Authority of India (FSSAI), The Export Inspection Council, World Health Organization (WHO), Food and Agriculture Organization (FAO), World Trade Organization (WTO).

Consumer Protection Act: rights of consumer and its major aspects.

Recommended Books:

- Adam MR and Moss MO. Food microbiology. New Age International (P) Ltd. ND.
- Jay JM. Modern Food Microbiology. CBS publishers ND.
- Potter NN. Food Science. CBS Publishers ND.
- Bhunia AK. Food borne Microbial Pathogens (Mechanism and Pathogenesis). Food Science text series Springer. Food Safety by Ian C Shaw: Publisher Wiley Blackwell.

BFST-502 Food Engineering

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

- **Units and Dimensions:** Fundamental and derived units, system of measurement, brief introduction to dimensions.
- **Material Balance & Energy Balance Calculations:** General principles, steady state and unsteady state problems
- **Screening:** Screening terminology, types of screens, effectiveness of screens

UNIT-II

- **Mixing:** Theory, measurement of mixing, rates of mixing, types of mixers
- **Sedimentation:** Theory, free and hindered settling, sedimentation equipments.
- **Filtration:** Theory of filtration, filtration equations for constant pressure and constant rate filtration, filtration equipments
- **Size Reduction:** General principles, size reduction equipments, modes of operation of size reduction plant, calculation of energy requirements for comminution of solids

UNIT-III

- **Mass Transfer Process:** Analogy between heat, mass and momentum transfer, Fick's Law of diffusion, Convective mass transfer coefficient, Basic mass transfer equations for molecular diffusion in solids, liquids and gases,
- **Psychrometry:** Properties of dry air, water vapor and water vapor mixture, psychrometric chart and its application.
- **Material Handling Process:** Introduction, Types of conveyors and application in food industry.

UNIT-IV

- **Heat Transfer:** Conductive heat transfer-Fourier's law, conduction through rectangular slab, hollow cylinder, spherical shell, composite rectangular wall (series) and composite cylinder. Convective heat transfer-convective heat transfer coefficient, free and forced convection, overall heat transfer coefficient. Types of Heat exchangers. Radiation: Stefan-Boltzmann law, Radiative heat transfer.
- **Thermal Process calculations**
Concept of D, Z and F values, evaluation of process time in canned foods by graphical and formula methods.

Recommended books:

- Fundamentals of Food Process Engineering by R.T. Toledo (3rd Edition), Springer (2008).
- Introduction to Food Process Engineering by P.G. Smith, (2nd Edition), Springer, (2011).
- Fundamentals of Food Engineering by D.G. Rao, (1st Edition) PHI Learning Pvt, Ltd, New Delhi (2010).
- Introduction to Food Engineering by R.P. Singh & D.R. Heldman (4th Edition) Academic Press (2009).
- Transport Processes and Unit Operations by C.J. Geankoplis (3rd Edition), Prentice Hall of India Pvt Ltd, New Delhi, (2009).

BFST-503 Entrepreneurial Development

Time: 3 Hrs.
Credits: 2

Max. Marks: 50
Theory: 30
IA: 20

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of six short questions of one mark each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units, carry six marks each. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Basics of entrepreneurship: Traits of an entrepreneur, self diagnosis.

Secrets of successful entrepreneurs: rules for success.

Prerequisites for startup of an entrepreneurship: startup funding, startup policy.

Management: startup management, financial management, talent management, total quality management and six sigma.

Detail Project Report (DPR).

UNIT-II

Food business management

- Case studies of Food Processing Business and its aspects
- Business opportunity Identification and Assessment techniques
- Business Idea Generation and evaluation exercise
- Market Assessment study Analysis of competitive situation
- SWOT Analysis for business and for competitors
- Preparation of business plan
- Preparation of project report
- Methods of Arrangement of inputs – finance and material

UNIT-III

Case studies of successful entrepreneurs:

Bharti Madhu,

Mithila Naturals

Jaggic,

Anand Sagar (Natural Dairy)

Background, entrepreneurial journey, product portfolios, strategic vision and learning from some these successful entrepreneurships.

UNIT-IV

Marketing:

Basics of Marketing.

Market Segmentation, Targeting and Positioning.

Consumer Behavior Research.

Advertising.

Online Marketing.

Recommended Books:

- Vasant Desai (2012) Fundamentals of Entrepreneurship and Small Business Management, Himalya Publishing House Pvt. Ltd., Mumbai
- Vasant Desai (2011) The Dynamics of Entrepreneurial Development and Management, Himalya Publishing House Pvt. Ltd., Mumbai
- D. David and S Erickson (1987) Principles of Agri Business Management , Mc Graw Hill Book Co., New Delhi.
- Acharya S S and Agarwal N L (1987) Agricultural Marketing in India, Oxford & ISH Publishing Co., New Delhi.

BFST-504 Lab-XV Food Safety & Food Laws

Time: 6 Hrs.

Max. Marks: 50

Credits: 2

1. Detection and estimation of food additives and adulterants.
2. Preparation of HACCP charts for meat industry.
3. Preparation of HACCP charts for dairy industry.
4. Preparation of HACCP charts for fruits and vegetable industry.
5. Preparation of HACCP charts for cereal industry.
6. Analysis of aflatoxins in fungal contaminated food product.
7. Visit to Food Industries.

BFST-505 Lab-XVI Food Engineering

Time: 6 Hrs.

Max. Marks: 50

Credits: 2

1. Calculation of mixing index for a given sample.
2. Calculation of specific cake and filter medium resistance in a filtration operation.
3. To study the working principle and operation of a hammer mill.
4. To study the working principle and operation of a roller mill.
5. Determination of particle size of given sample using Sieve analysis.
6. Determination of freezing time using Plank's equation.
7. Calculation of refrigeration load of cold storage plant.
8. To study dehydration characteristics of food materials.
9. To study the boiling point elevation of liquid foods and water.
10. To study freezing point depression by changing salts concentration in liquid foods and water
11. Design calculations of belt conveyor, bucket elevator and screw conveyor.

BFST-506A Food Additives

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Introduction to food additives: general classification, their types and uses in different foods. Advantages of additives in food processing and preservation. Natural, synthetic and nature identical food additives, labelling requirements and safety issues. Classification of spices, condiments and flavoring agents used in foods.

UNIT-II

Food preservatives: Antioxidants, antimicrobial agents and anti-browning agents (uses, functions and properties). Class-I and Class-II preservatives.
Food colours and pigments: Natural, synthetic and nature identical food colours, their properties, uses and functions in foods.
Acidulants and pH controlling agents: Acids, bases and buffers (properties and uses in foods).

UNIT-III

Emulsifiers/surface active agents, stabilizers, thickeners, firming agents, gelling agents, foaming agents, anti-caking agents/humectants, sequestrants/chelating agents. Clarifying agents, flavoring agents/flavor enhancers, bleaching agents and enzymes used in foods: their uses, functions and properties.

UNIT-IV

Nutritive and non nutritive sweeteners: Their properties, uses and functions in foods.
Food additives: Fact or fiction. Prohibited food additives. Safety assessment and legal aspects for food additives. Risks and benefits of food additives. FSSAI regulation regarding application of food additives.

Recommended books:

- Branen, A.L., Davidson, P.M., Salminen, S. and Thorngate J.H. III (2002). Food Additives. (2nd edition). Marcel Dekker Inc. New York.
- Owen R. Fennema (1996). Food Chemistry. (3rd edition). Marcel Dekker Inc. New York.
- Belitz, H.-D., Grosch, W. and Schieberle, P. (2009). Food Chemistry. (4th edition). Springer-Verlag Berlin, Heidelberg.
- N. Shakuntala Manay and M. Shadaksharaswamy (2008). Foods: Facts and Principles. (3rd edition) New Age International (P) Ltd. Publishers, New Delhi.
- John M. deMan (1999). Principles of Food Chemistry (3rd edition). Aspen Publishers, Inc. Gaithersburg, Maryland

BFST-506B Food Grain Storage

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Pests of stored grains and their classification. General problems of grain storage. Sources of infestation in stored food grains and their detection. Causes, types and content deterioration in stored food grains and methods to check them.

UNIT-II

Internal feeders of stored grains and their management. External feeders of stored grains and their management.

Traditional and modern methods of bag and bulk storage. Chemical, non chemical and integrated methods of controlling stored grain insect pest.

UNIT-III

New methods employed in managing stored grain pests: insect proof bins, insect proof bags, traps, irradiation, nanoparticles, silos, microwave technology, controlled atmosphere, low and high temperatures.

Storage structures and their significance for different food grains.

UNIT-IV

Toxic contaminants found in food grains due to pests and types of spoilages or decay caused by them in food grains.

Pesticidal contamination tolerance limits, residue found in stored grains and precautions for safe handling and use of pesticides in stored grains. Cleaning, aeration and drying of food grains before storage at farmers, commercial and Govt. levels. Role of moisture in spoilage of different stored food grains.

Recommended Books:

- Introduction of Insect-By Metalf & Lukemann.
- Pesticides and Pollution–By Mollan.

BFST-507A XVII Lab- Food Additives

Time: 6 Hrs.

Max. Marks: 50

Credits: 2

1. Description of generally recommended as safe (GRAS) food additives.
2. Spectrophotometric method for total chlorophyll determination.
3. Clarification of fruit juices with various chemical and physical methods.
4. Use of additives in bakery, fruits, vegetables, milk and meat products.
5. Determination of adulteration in milk, cereals, oils & fats, spices.

BFST-507B Lab-XVII Food Grain Storage

Time: 6 Hrs.

Max. Marks: 50

Credits: 2

1. To study various insect pests of grains.
2. To study the quality tests and physical parameters for grains.
3. To store the grains and check its shelf life.
4. To study the various pesticides used for grain storage.
5. To study the effect of moisture on spoilage of grains.
6. Visit to grain storage godowns.

BFST-601 Nutraceuticals & Functional Foods

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Nutraceuticals: basic concepts and origin. Classification of nutraceuticals on the basis of food source and chemical/biochemical nature.

Functional foods: basic concepts and their categories. Plant and animal source based functional foods.

Role of functional foods and their bioactive (nutraceuticals) compounds in health promotion.

UNIT-II

Introduction to probiotics: basic concepts, their attributes, need and mechanisms of action. Basic concepts of prebiotics and synbiotics. Role of probiotics in disease prevention.

Bioactive compounds: Phytochemicals and phytosterols as nutraceuticals and functional foods.

Dietary fibers (soluble and insoluble dietary fibers) and complex carbohydrates, fats and proteins as functional foods and nutraceuticals.

UNIT-III

Significance of functional foods and nutraceuticals in management of various chronic diseases: cancer, CVDs, diabetes, stress, joints and bone problems.

Tea, coffee and other functional food beverages: their nutritional significances and bioactive compounds.

UNIT-IV

Cereals (oats, wheat, millets and rice etc.) based functional foods. Fruits, vegetables, oilseeds and sea foods as functional foods and nutraceuticals.

Regulatory system for functional foods and nutraceuticals; safety issues and functional food regulations in India and International regulations. Functional foods available in the market.

Recommended books:

- Robert E.C. Wildman (2001). Handbook of Nutraceuticals and Functional Foods. CRC Press. Boca Raton, London, New York, Washington, D.C.
- Robert E.C. Wildman (2007). Handbook of Nutraceuticals and Functional Foods. (2nd edition) CRC Press. Boca Raton, London, New York, Washington, D.C.

BFST-602 Food Analysis & Instrumentation

Credits: 4

Periods per week: 4 Hrs.

Duration of exam: 3 Hrs

Max. Marks: 100

Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Sampling: basic concepts of sampling, types of samples and sampling. Storage and preservation methods for samples.

Chemical composition analysis of food products: principles and basic concepts for moisture, carbohydrates, protein, fat, fiber and mineral analysis.

Various analytical procedures and their principles: temperature, pH, turbidity etc.

UNIT-II

Chromatography: Principle and working of paper chromatography, thin layer chromatography, Column chromatography, Gas chromatography and High Pressure Liquid Chromatography.

Electrophoresis: basic principle and working electrophoresis technique of gel, paper, high voltage and starch gel electrophoresis.

Brief introduction and principles to Separation techniques: filtration, centrifugation and supercritical fluid extraction.

UNIT-III

Analysis of rheological and pasting behaviours of food material: rheometer, visco-amylograph and farinograph: basic principle and working.

Sensory evaluation of foods: sensory characteristics of foods. Methods for sensory evaluation: discrimination tests, rating tests, sensitivity tests, descriptive analysis and affective tests (consumer tests).

Colour measurements: hunter colorimeter, basic concept and working principle.

UNIT-IV

Brief introduction and principles: Spectroscopic techniques using UV/Visible, polarimetry, refractometry (hand refractometer and Abbe refractometer).

Microscopic techniques in food analysis (light microscopy).

Microbiological examination of food materials: basic concept and methods to detect microbiological contamination in food materials.

Analysis of properties of milk and milk products: fat content, SNF (solid not fat), CLR (corrected lactometer reading), titer-able acidity, detection of various adulterants in milk: basic concept and principles.

Recommended Books:

- AOAC International. 2003. Official methods of analysis of AOAC International. 17th Ed. Gaithersburg, MD, USA, Association of Analytical Communities.
- Kirk RS & Sawyer R. 1991. Pearson's Chemical Analysis of Foods. 9th Ed. Longman Scientific & Technical.
- Nielsen S. (Eds.). 1994. Introduction to Chemical Analysis of Foods. Jones & Bartlett.
- Pomrenz Y & Meloan CE. 1996. Food Analysis - Theory and Practice. 3rd Ed. CBS.

BFST-603 Home Based Food Business Development

Time: 6 Hrs.
Credits: 2

Max. Marks: 50
Theory: 30
IA: 20

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of six short questions of 1 mark each covering the whole syllabus. In addition eight more questions (6 marks each) will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Introduction to Food Service

Factors contributing to the growth of food service industry
Kinds of food service establishments

UNIT-II

Food Production

Menu planning: Importance of menu, Factors affecting menu planning, Menu planning for different kinds of food service units.

Food Purchase and Storage

Quantity Food production: Standardization of recipes, quantity food preparation techniques, recipe adjustments and portion control.

Hygiene and Sanitation.

UNIT-III

Resources:

- Money
- Manpower
- Time
- Facilities and equipment
- Utilities

UNIT-IV

Planning of a Food Service Unit

Preliminary Planning

Survey of types of units, identifying clientele, menu, operations and delivery

Planning the set up:

- Identifying resources
- Developing Project plan
- Determining investments
- Project Proposal

Recommended Books:

- West B Bessie & Wood Levelle. Food Service in Institutions 6th Edition Revised By
- Hargar FV, Shuggart SG, & Palgne Palacio June, Macmillian Publishing Company
- New York. 1988.
- Sethi Mohini . Institution Food Management New Age International Publishers. 2005.
- Knight J B & Kotschevar LH. Quantity Food Production Planning & Management 3rd edition John Wiley & Sons. 2000.
- Philip E Thangam. Modern Cookery for teaching and Trade Part I & II Orient Longman. 2008.
- Taneja S and Gupta SL. Entrepreneurship development, Galgotia Publishing. 2001.

BFST-604 Lab-XVIII Nutraceuticals & Functional Foods

Time: 6 Hrs.
Credits: 2

Max. Marks: 50

1. Extraction and estimation of lycopene content in tomato and tomato products.
2. Determination of DPPH radical scavenging activity of different raw and processed food samples.
3. Extraction and estimation of total phenolic contents of different food samples.
4. Extraxtion of lycopene from raw sample and formulation of new product (functional food product) with higher antioxidant activity.
5. Extraction and estimation of carotene from raw carrot samples.
6. Formulation of probiotic functional foods (yoghurt, dahi etc.) and its sensory evaluations.
7. Formulation of functional food with better antioxidant activity, reducing power and total phenolic contents.
8. Estimation of total flavonoids content (catechin) of tea samples.

BFST-605 Lab-XIX Food Analysis & Instrumentation

Time: 6 Hrs.

Max. Marks: 50

Credits: 2

1. Estimation of pH, conductivity, salinity and TDS (total dissolved solids) of different liquid foods and water.
2. Estimation of proteins, fat and fiber in given food sample.
3. Separation and estimation of gluten content from wheat flour sample.
4. Separation and identification of carotenoids by thin layer and/or column chromatography.
5. Isolation of starch and its analysis of its rheological properties.
6. Demonstration of instruments: GLC, HPLC, Atomic absorption, Flame photometer, Farinograph, UV-Vis spectrophotometer and microscopes.

BFST-606 Food Plant Layout

Credits: 4
Periods per week: 4 Hrs.

Duration of exam: 3 Hrs
Max. Marks: 100
Theory: 70 IA: 30

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Plant Location: Concept and factors governing plant location. Locational economics—comparison of rural vs. urban plant sites, plant site selection guide. Importance of a plant layout selection of site.

UNIT-II

Plant Layout: Classes of layout problems, objectives, principles and types of layouts – process layout, product layout, combination layout, fixed position layout; methods and tools of plant and factory layouts; plant layout procedures.

Factory Building: Selection of building material for floors, walls, roofs, etc., Process selection; process flow charts, selection of equipment and machinery; maintenance and replacement, depreciation of machinery. Considerations in building design, types of factory buildings.

Selection and planning of manufacturing process and service facilities.

UNIT-III

Network Analysis of Processes: Basic terms, objectives and advantages of network analysis, various network techniques, PERT and CPM techniques, smoothing.

Cost Analysis: Fixed cost, variable cost, depreciation, methods of economic analysis, profitability analysis of a plant.

UNIT-IV

Management set up in a plant

Layouts: Layouts of different types of food and fermentation industries – canning, dairy, bread, biscuit, beer, tomato processing, rice mill and wheat mill.

Plant Maintenance: Objectives and importance of maintenance, types of maintenance – corrective or Breakdown, Maintenance, scheduled maintenance, preventive maintenance and predictive maintenance. Plant layout symbols.

Recommended Books:

- Principle of Food Sanitation by Marriott, 5th Ed., 2006, CBS Publishers, New Delhi.
- Food Processing Waste Management by Green JH and Kramer A, 1979, AVI Publishers, USA.
- Food Science by Potter NN, 5th Ed., 2006, CBS Publishers, New Delhi.
- Plant layout and material handling by Sharma S.C.
- Plant layout & design by James Moore.

BFST-607 Lab-XX Food Plant Layout

Time: 6 Hrs.
Credits: 2

Max. Marks: 50

1. Preparation of layout and process diagram of potato crisp manufacturing plant.
2. Preparation of layout and process diagram of Jam/Marmalade manufacturing plant.
3. Preparation of layout and process diagram of Bread making plant.
4. Preparation of layout and process diagram of a dairy industry.
5. Preparation of layout and process diagram of wine making unit.
6. Preparation of layout and process diagram of a modern slaughter house.
7. Preparation of layout and process of diagram of a confectionary unit.
8. Calculation of depreciation of machinery and processing costs.