COURSE CURRICULUM AND SCHEME OF EXAMINATION

Under

Choice Based Credit System

For

B. Sc. (Food Science and Technology)

w. e. f. Academic Session 2020-21 onwards

(1st to 6th Semester)

B. Sc. Food Science and Technology (1st Semester) w.e.f. 2020-21 onwards									
Sr. No.	**Course ID**	**Subject**	**Type**	**Credits**	**Contact Hours per week**	**Internal Assessment (IA)***	**External Exam**	**Maximum Marks**	**Duration of Exam (hours)**
1	BFST-101A	Principles of Food Science (Theory)	CC	4	4	20	80	100	3
	BFST-101 B	Principles of Food Science (Lab)	CC	2	4	00	50	50	6 (Two session of 3 Hrs. each)
2	BFST-102 A	Fundamentals of Food Technology (Theory)	CC	4	4	20	80	100	3
	BFST-102 B	Fundamentals of Food Technology (Lab)	CC	2	4	00	50	50	6 (Two session of 3 Hrs. each)
3.	BFST- 103 A	Technology of Food Processing (Theory)	CC	4	4	20	80	100	3
	BFST- 103 B	Technology of Food Processing (Lab)	CC	2	4	00	50	50	6 (Two session of 3 Hrs. each)
4	BFST-104	Environmental Studies (Theory)	AECC	2	2	20	30	50	3
Total				**20**	**26**	**80**	**420**	**500**	

*IA = 20 Marks (10-Midterm examination; 5-Assignment hand written; 5-Attendance)

CC: Core course **AECC:** Ability enhancement compulsory course

B. Sc. Food Science and Technology (2nd 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-201 A	Technology of Food Preservation (Theory)	CC	4	4	20	80	100	3
	BFST-201 B	Technology of Food Preservation (Lab)	CC	2	4	00	50	50	6 (Two session of3 Hrs. each)
2	BFST-202 A	Chemistry of Food (Theory)	CC	4	4	20	80	100	3
	BFST-202 B	Chemistry of Food (Lab)	CC	2	4	00	50	50	6 (Two session of 3Hrs. each)
3	BFST- 203 A	Technology of Cereals & Legumes (Theory)	CC	4	4	20	80	100	3
	BFST-203 B	Technology of Cereals & Legumes (Lab)	CC	2	4	00	50	50	6 (Two session of 3Hrs. each)
4	BFST-204	Proficiency in English (Theory)	AECC	2	2	20	30	50	3
Total				**20**	**26**	**80**	**420**	**500**	

*IA = 20 Marks (10-Midterm examination; 5-Assignment hand written; 5-Attendance)

CC: Core course **AECC:** Ability enhancement compulsory course

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 A	Food Microbiology (Theory)	CC	4	4	20	80	100	3
	BFST-301 B	Food Microbiology (Lab)	CC	2	4	00	50	50	6: (Two session of 3Hrs. each)
2.	BFST-302 A	Technology of Fruits & Vegetables (Theory)	CC	4	4	20	80	100	3
	BFST-302 B	Technology of Fruits & Vegetables (Lab)	CC	2	4	00	50	50	6: (Two session of 3Hrs. each)
3.	BFST-303 A	Food Engineering (Theory	CC	4	4	20	80	100	3
	BFST-303B	Food Engineering (Lab)	CC	2	4	00	50	50	6: (Two session of 3Hrs. each)
4.	BFST-304	Food Fermentation Technology (Lab)	SEC	2	4	00	50	50	6: (Two session of 3Hrs. each)
Total				20	28	60	440	500	

*IA = 20 Marks (10-Midterm examination; 5-Assignment hand written; 5-Attendance)

CC: Core course **SEC:** Skill Enhancement Course

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 A	Technology of Milk & Milk Products (Theory)	CC	4	4	20	80	100	3
	BFST-401 B	Technology of Milk & Milk Products (Lab)	CC	2	4	00	50	50	6: (Two session of 3Hrs. each)
2	BFST-402 A	Food Safety & Food Laws (Theory)	CC	4	4	20	80	100	3
	BFST-402 B	Food Safety & Food Laws (Lab)	CC	2	4	00	50	50	6: (Two session of 3Hrs. each)
3.	BFST-403 A	Food Analysis & Instrumentation (Theory)	CC	4	4	20	80	100	3
	BFST-403 B	Food Analysis & Instrumentation (Lab)	CC	2	4	00	50	50	6: (Two session of 3Hrs. each
4.	BFST-404	Food Product Development (Lab)	SEC	2	4	00	50	50	6: (Two session of 3Hrs. each)
Total				20	28	60	440	500	

*IA = 20 Marks (10-Midterm examination; 5-Assignment hand written; 5-Attendance)

CC: Core course **SEC:** Skill enhancement course

B. Sc. Food Science and Technology (5th Semester)										
Sr. No.		Course ID	Subject	Type	Credits	Contact Hours per week	Internal Assessment (IA)*	External Exam	Maximum Marks	Duration of Exam (hours)
1A	**(TO BE OPTED ANY ONE OUT OF 1A & 1B)**	BFST-501A	Technology of Egg, Poultry & Meat (Theory)	DSE	4	4	20	80	100	3
		BFST-501B	Technology of Egg, Poultry & Meat (Lab)	DSE	2	4	00	50	50	6:(Two session of 3Hrs. each)
1 B		BFST-502 A	Confectionary & Sugar Technology (Theory)	DSE	4	4	20	80	100	3
		BFST-502 B	Confectionary & Sugar Technology (Lab)	DSE	2	4	00	50	50	6:(Two session of 3Hrs. each)
2A	**(TO BE OPTED ANY ONE OUT OF 2A & 2B)**	BFST-503A	Food Plant Hygiene & Sanitation (Theory)	DSE	4	4	20	80	100	3
		BFST-503B	Food Plant Hygiene & Sanitation (Lab)	DSE	2	4	00	50	50	6:(Two session of 3Hrs. each)
2B		BFST-504 A	Basic Concepts of Nutrition (Theory)	DSE	4	4	20	80	100	3
		BFST-504 B	Basic Concepts of Nutrition (Lab)	DSE	2	4	00	50	50	6:(Two session of 3Hrs. each)
3A	**(TO BE OPTED ANY ONE OUT OF 3A & 3B)**	BFST-505 A	Bakery Technology (Theory)	DSE	4	4	20	80	100	3
		BFST-505 B	Bakery Technology (Lab)	DSE	2	4	00	50	50	6:(Two session of 3Hrs. each)
3B		BFST-506 A	Basic Concepts of Oils & Fats (Theory)	DSE	4	4	20	80	100	3
		BFST-506 B	Basic Concepts of Oils & Fats (Lab)	DSE	2	4	00	50	50	6:(Two session of 3Hrs. each)
4		BFST-507	Home Based Food Business Development (Theory)	SEC	2	2	20	30	50	3
	Total				20	26	80	420	500	

*IA = 20 Marks (10-Midterm examination; 5-Assignment hand written; 5-Attendance) **DSE**: Discipline Specific Elective **SEC:** Skill enhancement course

B. Sc. Food Science and Technology (6th Semester)										
Sr. No.		Course ID	Subject	Type	Credits	Contact Hours per week	Internal Assessment (IA)*	External Exam	Maximum Marks	Duration of Exam (hours)
1A	(**TO BE OPTED ANY ONE OUT OF 1A & 1B)**	BFST-601A	Food Additives (Theory)	DSE	4	4	20	80	100	3
		BFST-601B	Food Additives (Lab)	DSE	2	4	00	50	50	6:(Two session of 3Hrs. each)
1 B		BFST-602 A	Food Grain Storage (Theory)	DSE	4	4	20	80	100	3
		BFST-602 B	Food Grain Storage (Lab)	DSE	2	4	00	50	50	6:(Two session of 3Hrs. each)
2A	**(TO BE OPTED ANY ONE OUT OF 2A & 2B)**	BFST-603A	Nutraceuticals & Functional Foods (Theory)	DSE	4	4	20	80	100	3
		BFST-603B	Nutraceuticals & Functional Foods (Lab)	DSE	2	4	00	50	50	6:(Two session of 3Hrs. each)
2B		BFST-604 A	Food Packaging (Theory)	DSE	4	4	20	80	100	3
		BFST-604 B	Food Packaging (Lab)		2	4	00	50	50	6:(Two session of 3Hrs. each)
3A	**(TO BE OPTED ANY ONE OUT OF 3A & 3B)**	BFST-605 A	Food Plant Layout (Theory)	DSE	4	4	20	80	100	3
		BFST-605 B	Food Plant Layout (Lab)		2	4	00	50	50	6:(Two session of 3Hrs. each)
3B		BFST-606	Research Project (Lab)	DSE	6	8	20	130	150	
4		BFST-607	Entrepreneurship Development (Theory)	SEC	2	2	20	30	50	3
	Total				20	26	80	420	500	

*IA = 20 Marks (10-Midterm examination; 5-Assignment hand written; 5-Attendance) DSE Discipline Specific Elective **SEC** Skill enhancement course

B. Sc. Food Science and Technology (Open elective course)									
Sr. No.	**Course ID**	**Subject**	**Type**	**Credits**	**Contacts Hours per week**	**Internal Assessment (IA)***	**External Exam**	**Maximum Marks**	**Duration of Exam (Hours)**
1	BFST- OEC-101 (Odd semesters)	Health & Nutrition (Theory)	OEC	2	2	20	30	50	3
2.	BFST- OEC-201 (Even semesters)	Food Adulteration (Theory)	OEC	2	2	20	30	50	3

*IA = 20 Marks (10-Midterm examination; 5-Assignment hand written; 5-Attendance) **OEC:** Open Elective Course

Principles of Food Science

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-101A- Principles of Food Science (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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-1

Food dispersions: Characteristics, sols, gels, pectin gels, colloidal sols, stabilization of colloidal system, emulsions, properties of emulsions, formation of emulsion, emulsifying agent, food foams, formation stability, application of colloidal chemistry to food preparation. **Sensory Evaluation of food:** Objectives, type of food sensory panels, characteristics of panel member, paired comparison test, duo- trio test, triangle test, hedonic scale.

UNIT-ll

Growth of microorganisms in foods: Food as a substrate for microorganism, factors affecting growth of microbes: pH, water activity, redox potential, nutrient contents. **Hurdle technology:** Principles and applications, various types of hurdles, application of hurdle technology in food preservation.

UNIT-lll

Minimal processing: Minimal processing of foods with thermal methods and non-thermal methods, safety criteria in minimally processed foods, Minimal processing in practice various foods (fruits and vegetables, seafood), effect on quality, Future developments.

UNIT-lV

Water disposal and sanitation: Waste water, hardness of water, break point chlorination, physical and chemical of impurities, BOD, COD, waste water treatment.

Plant sanitation, CIP system, types of sanitization, chemicals used in plant sanitization, sanitizers used in food industry.

Recommended Readings

1. Coles R, McDowell D and Kirwan MJ, Food Packaging Technology, CRC Press, 2003
2. De S, Outlines of Dairy Technology, Oxford Publishers, 1980
3. Deman JM, Principles of Food Chemistry, 2nd ed. Van Nostrand Reinhold, NY 1990
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004
5. Manay NS and Shadaksharaswamy M, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi, 1987
6. Meyer LH, Food Chemistry, CBS Publication, New Delhi, 1987
7. Potter NH, Food Science, CBS Publication, New Delhi, 1998
8. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press, 2006
9. Ranganna S, Handbook of Analysis and Quality Control for Fruits and Vegetable Products, 2nd ed. TMH Education Pvt. Ltd, 1986

BFST-101B- Principles of Food Science (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

1. Estimation of reducing sugar by Fehling's procedure.
2. Estimation of salt content in brine.
3. Estimation of salt content in butter.
4. Preparation of brix solution and checking by hand refractometer.
5. Application of colloidal chemistry to food preparation.
6. Demonstration of the Soxhlet method for determination of fat content.
7. Determination of acidity of water.
8. Determination of alkalinity/ hardness of water.
9. Demonstration of the Kjeldahl's method for estimation of protein content.

Fundamentals of Food Technology

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-102A- Fundamentals of Food Technology (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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-1

Wheat: structure and composition, types (hard, soft/strong, weak) Diagrammatic representation of longitudinal structure of wheat grain. Gelatinization of starch, types of browning- Maillard & caramelization.

Rice: structure, composition and application **Corn**: structure, composition and uses.

UNIT-ll

Fruits and Vegetables: Classification of fruits and vegetables, general composition,

Postharvest changes in fruits and vegetables: Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.

UNIT-lll

Milk and Milk Products: Definition of milk, chemical composition of milk, its constituents and their importance, physicochemical properties of milk, factor affecting the composition of milk.

Processing of milk: Pasteurization, homogenization, standardization and sterilization of milk. An overview of types of market milk and milk products.

UNIT-lV

Flesh Foods - Meat, Fish, Poultry:

Meat: Definition of carcass, composition of meat, marbling, and post-mortem changes in meat-rigor mortis, tenderization of meat, ageing of meat.

Poultry: Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality.

Recommended Readings

1. Bawa, A.S., Chauhan, O.P. et.al., Food Science. New India Publishing agency, 2013.
2. Roday, S. Food Science, Oxford publication, 2011.
3. B. Srilakshmi, Food science, New Age Publishers, 2002.
4. Meyer, Food Chemistry, New Age, 2004.
5. De Sukumar, Outlines of Dairy Technology, Oxford University Press, 2007.

BFST-102 B Fundamentals of Food Technology (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

1. Study different types of browning reactions: enzymatic and non-enzymatic.
2. To study gelatinization behavior of various starches.
3. To study the concept of gluten formation of various flours.
4. To study malting and germination.
5. To study dextrinization in foods.
6. Identification of pigments in fruits and vegetables and influence of pH on them.
7. Quality inspection of animal foods.

Technology of Food Processing

CREDITS: (THEORY – 4 PRACTICAL - 2)

BFST-103A- Technology of Food Processing (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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-1

Refrigeration and Freezing: Requirements of refrigerated storage - controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing, Freezing methods -direct and indirect, still air sharp freezer, blast freezer, fluidized freezer, plate freezer, spiral freezer and cryogenic freezing.

Dehydration: Normal drying curve, effect of food properties on dehydration, change in food during drying, Drying methods and equipment.

UNIT-ll

Thermal Processing of Foods: Classification of thermal processes, Principles of thermal processing, commercial canning operations, Aseptic Processing, UHT,

Irradiation and microwave heating: Principles, Dosage, Applications of Irradiation, Mechanism of microwave heating and applications.

UNIT-lll

Food Additives: Introduction, need of food additives in food processing and preservation, Characteristics and classification of food additives,

Regulations regarding additives: Chemical, technological and toxicological aspects of food additives, Application of additives in various foods. Labeling requirements for additives.

UNIT-lV

Contamination in Food: Physical, chemical (heavy metals, pesticide residues, antibiotics, veterinary drug residues, dioxins, environmental pollutants, solvent residues, chemicals) Natural toxins and their sources in food chain.

Food Laws and Regulations: Codex, HACCP, ISO, FSSA etc.

Recommended Readings:

1. Potter NH, 1998, Food Science, CBS Publication, New Delhi
2. Ramaswamy H and Marcotte M, 2009, Food Processing Principles and Applications CRC Press
3. Deman JM,2007, Principles of Food Chemistry, 3rd ed. Springer
4. Manay NS and Shadaksharaswamy M,1987, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi

BFST-103B- Technology of Food Processing (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

1. Canning of foods
2. Preservation of food by the process of freezing
3. Drying of food using Tray dryer/other dryers
4. Estimation of Chemical Oxygen Demand (Demonstration)
5. Preparation of brix solution and checking by hand refractometer
6. Analysis of water quality
7. Minimal Processing of various food
8. Application of colloidal chemistry in food preparation.

BFST-104 Environmental Studies (Theory)

Credits: 2 Duration of exam: 3 Hrs.
Periods per week: 2 Hrs Max. Marks: 50
Theory: 30 IA: 20

Note for the paper setter: The question paper will consists of nine questions in all. The first question will be compulsory and will consists of six short questions of one 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, carry six marks each. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

The multidisciplinary nature of environmental studies: Definition, scope and importance, need for public awareness.
Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.
Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

UNIT-II

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT-III

Environmental Pollution: Definition-Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution.
Water conservation, rain water harvesting, watershed management,
Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

UNIT-IV

Human population and the environment: Population growth, variation among nations, Population explosion-Family welfare programme,
Environment and human health: Human rights, Value education, HIV/AIDS, Women and child welfare, Role of information technology in environment and human health.

Suggested readings:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publ. Ltd. Bikaner.
2. Bharucha, Erach. The biodiversity of India. Mapin Publishing Pvt. Ltd. Ahmedabad 380013, India.

3. Clerk, RS., Down to Earth, Centre for Science and Environment, New Delhi.
4. Down to earth, centre for Science and Environment.
5. Hawkins R.E., Encyclopedia of Indian National History, BombayNatural History Society, Bombay.
6. Mhaskar A.K, Matter Hazardous, Techno-Science Publications.
7. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science.
8. Trivedi RK and PK Goel, Introduction to air pollution, Techno-Science Publications.
9. Trivedi RK. Handbook of Environmental Laws, Rules, Guidelines Compliances and Standards. Vol I and II, Envirol Media.
10. Wagner KD., 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA.

Open elective course for odd semester offered by Department of Food Science and Technology, University College

BFST-OEC-101 Health & Nutrition

Credits: 2 Duration of exam: 3 Hrs.
Periods per week: 2 Hrs. Max. Marks: 50
Theory: 30 IA: 20

Note for the paper setter: The question paper will consists of nine questions in all. The first question will be compulsory and will consists of six short questions of one 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, carry six marks each. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT-I

Basic terminologies- nutrition, health, RDA (recommended dietary allowance), diet, hunger, satiety, BMR (basal metabolic rate), BMI (body mass index).
Food and nutrients- basic definitions, function of food and nutrients, Water and its role in human health and nutrition.

UNIT-II

Obesity- it causes, body composition, weight for height measure, health implication of obesity. BMI and factor affecting BMI.
Carbohydrates- classification, dietary importance and function of carbohydrates.

UNIT-III

Fat- functions of fats, cholesterol, LDL & HDL and their health importance.
Protein - nature and function of proteins, biological value, net protein utilization, protein efficiency ratio, dietary importance and function of Proteins.

UNIT-IV

Vitamins- sources and requirements of vitamins, functions of vitamin- A, D, E, K, C and vit. B complex.
Minerals- minerals in human health, macro and micro minerals, food sources and requirements of minerals.

Recommended Book:
Food Nutrition: M. Swami Nathan Vol. I, II.

Technology of Food Preservation

CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-201A- Technology of Food Preservation (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists of nine questions in all. The first question will be compulsory and will consists 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-1

Food Microbiology: Principles of Food Preservation, microorganisms associated with foods-bacteria, yeast and mold, Importance of bacteria, yeast and molds in foods.

Classification of microorganisms: based on temperature, pH, water activity, nutrient and oxygen requirements, typical growth curve of micro-organisms. Definition of shelf life, perishable foods, semi perishable foods and shelf stable foods.

UNIT-II

Food preservation by Freezing and Refrigeration:, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e., slow freezing, quick freezing,

Refrigeration: Introduction to refrigeration: refrigeration load, effect of freezing and refrigeration of microbial growth.

UNIT-III

Thermal processing and food preservation: Commercial heat preservation methods: Sterilization, commercial sterilization, Pasteurization, and blanching. effect of thermal processing on microbial growth.

Radiation in food preservation: Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization,

UNIT-IV

Food Preservation by Moisture control: Drying and Dehydration - Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), heat and mass transfer, factors affecting rate of drying, normal drying curve, names of types of driers used in the food industry.

Evaporation: Definition, factors affecting evaporation, names of evaporators used in food industry.

Recommended Readings

1. B. Srilakshmi, Food science, New Age Publishers, 2002
2. Meyer, Food Chemistry, New Age, 2004

3. Bawa. A.S, O.P Chauhanetal.Food Science. New India Publishing agency, 2013
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004

BFST-201B- Technology of Food Preservation (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

1. Methods of Sampling.
2. Concept of shelf life of different foods.
3. To study the concept of Asepsis and sterilization.
4. Determination of pH of different foods using pH meter.
5. Study quality characteristics of foods preserved by drying/dehydration/ freezing.
6. To perform pasteurization of fluids using different methods.
7. To perform blanching of different plant foods.

Chemistry of Food

CREDITS: (THEORY – 4 PRACTICAL - 2)

BFST-202A- Chemistry of Food (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists of nine questions in all. The first question will be compulsory and will consists 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-1

Introduction to Food Chemistry: Composition of food, definition of water in food, Structure of water and ice, Types of water, Role of water activity.
Lipids: Classification of lipids, Physical and chemical characteristics, Chemical deterioration of fats and oils (auto oxidation, rancidity, lipolysis, flavor reversion).

UNIT-ll

Carbohydrates: Classification, Structure and Chemical reactions of carbohydrates.
Protein: classification and structure, types of food proteins (plant and animal proteins), Physicochemical and functional properties of proteins.
Vitamins: Types (Water soluble vitamins and Fat soluble vitamins).

UNIT-lll

Minerals: Major and minor minerals, Toxic minerals in food.
Food Flavors: Definition and basic tastes, Description of some common food flavors.
Natural Food Pigments: Introduction and classification, Types of food pigments (chlorophyll, carotenoids, anthocyanin and flavonoids, beet pigments, caramel).

UNIT-lV

Browning Reactions in Food: Types, Enzymatic and Non enzymatic Browning and their control measure.
Enzymes: Introduction, classification, General characteristics, Important enzymes in food processing. Physico-chemical and nutritional changes occurring during food processing.

Recommended Readings:

1. DeMan, John M.1982. Principles of Food Chemistry, 3rd Ed., Springer
2. Desrosier, Norman W. and Desrosier., James N.1977.The technology of food preservation, 4th Ed.,Westport, Conn. : AVI Pub. Co.
3. Fennema, Owen R1996. Food Chemistry, 3rd Ed., Marcell Dekker, New York,
4. Whitehurst and Law.2002. Enzymes in Food Technology, CRC Press, Canada
5. Wong, Dominic WS.1885. Food Enzymes, Chapman and Hall, New York
6. Potter, N.N. and Hotchkiss,J.H.1995. Food Science5th Ed., Chapman & Hall

BFST-202B- Chemistry of Food (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

1. Preparation of primary and secondary solutions.
2. Estimation of moisture content.
3. Determination of gelatinization temperature range (GTR) of different starches and effect of additives on GTR.
4. Determination of percent free fatty acids.
5. Estimation of Peroxide Value.
6. Estimation of Total Ash.
7. Estimation of Protein Content.

Technology of Cereals & Legumes

CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-203A- Technology of Cereals & Legumes (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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

Wheat: Wheat milling, flour types and usage, Improvers and Bleachers: their principle and action. Quality criteria for wheat flour, physical dough testing instruments,

Wheat based bakery products: Major and minor ingredients used for bakery products, leavening agents. Preparation methods of bread, cookies and cakes.

UNIT-II

Rice: Traditional and modern milling of paddy. Parboiling of paddy: various methods of parboiling and their advantages and disadvantages, changes in rice during parboiling Storage and uses of rice bran, Rice Bran Oil: extraction of rice bran oil, processing and its applications in food industry.

Corn: Corn dry and wet milling, products of wet and dry milling and their application. Corn starch and corn sweeteners, corn germ oil extraction and its application in food.

UNIT-III

Barley: Malting of barley, process of malting, types of malt and their applications. Brewing of barley to prepare beer, cereal based breakfast foods.

Pulses: Introduction and chemical composition of pulses, Milling of pulses: Decortication and polishing of pulses.

UNIT IV

Antinational compounds in pulses: Toxic constituents of pulses, methods to minimize antinational compounds.

Pulses based food products: Pulse protein concentrates, process of concentrates formation and their application, Soybean curd and milk. Protein enriched cereal foods. Extruded soybean products: processing and advantages.

Recommended Books:

1. Technology of Cereals by Kent N. L. and Evers AD, 4th Ed., 1983, Woodhead Publishing Ltd., UK.
2. Principle of Cereal Science & Technology by Kent. NL, 1983, Pergamon Press, London, UK.
3. The Chemistry & Technology of Cereal as Food & Feed by Maiz S.A, 1996, CBS Publishers, New Delhi.
4. Food Science by Potter N, 5th Ed., 2006, CBS Publisher, New Delhi.

BFST-203B- Technology of Cereals & Legumes (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

1. Physico-chemical testing of wheat and rice.
2. Milling of rice and assessment of per cent of head, broken, immature kernels degree of polishing etc.
3. Parboiling and evaluation of quality of parboiled rice.
4. Evaluation of cooking quality of rice.
5. Conditioning and milling of wheat.
6. Determination of quality characteristics of flours.
7. Rheological properties of dough using Farinograph/Extensograph/Mixograph.
8. Pasting properties of starches using Visco-amylograph/RVA.
9. Baking of bread, cookies and cakes and evaluation of their quality.
10. Processing of paste goods and evaluation of their quality.
11. Extrusion cooking and quality evaluation of extrudates.
12. Visit to wheat and rice, processing plants.

BFST-204 Proficiency in English (Theory)

Credits: 2 Duration of exam: 3 Hrs.
Periods per week: 2 Hrs. Max. Marks: 50
Theory: 30 IA: 20

Note for the paper setter: The question paper will consists of nine questions in all. The first question will be compulsory and will consists of six short questions of one 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, carry six marks each. The candidates are required to attempt four more questions selecting at least one question from each unit.

Objectives: The Objective of this course is to help the students in develop the communication skills with the use of English language.

UNIT-I

Grammar and Usage: A detailed study of Nouns, Pronouns, Adjectives, Articles, Verbs, Adverbs, prepositions, conjunctions and their correct use.

UNIT-II

Grammar and usage: Active and Passive Voice, Transformation of sentences from simple to compound/Complex sentences, narration/Reported speech.

UNIT-III

Vocabulary: Antonyms and Synonyms, words often confused, Important Latin and English Prefixes and Affixes, common legal terms (meaning and usage).

UNIT-IV

Composition skills: Formal letter writing, writing of business letters, official letters and CVs, paragraph writing and punctuation.

Suggested readings:

1. Wren and Martin: High School English Grammar and Composition
2. Tickoo and Subramaniam: A Functional Grammar and usage and composition
3. Murphy, Raymond: Essential English grammar, Cambridge University press
4. Maison, Margaret M. Examine Your English
5. Allen W.S. : Living English Structure
6. FlewingsHartin: Advanced English grammar, Cambridge University press
7. 50 ways to Improve Your Business English, without too much effort, Ken Taylor, Hyderabad: Orient Blackswan Business Communication, Ed., Om P Juneja and Artimujumdar, Hyderabad: Orient Blackswan

Open elective course for even semesters offered by Department of Food Science and Technology, University College

BFST-OEC-201-Food Adulteration

Credits: 2 Duration of exam: 3 Hrs.
Periods per week: 2 Hrs. Max. Marks: 50
Theory: 30 IA: 20

Note for the paper setter: The question paper will consists of nine questions in all. The first question will be compulsory and will consists of six short questions of one 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, carry six marks each. The candidates are required to attempt four more questions selecting at least one question from each unit.

Unit I

Introduction and concept: Food Adulteration – Definition, concept, classification of adulterants, Food Contaminants, difference between adulterants and contaminants

Common food adulterants: List of foods commonly adulterated, harmful effects of adulterants. Economic effect of adulteration.

Unit II

Adulteration in milk and milk products: Common adulterants in milk and milk products. Household and laboratory scale methods to detect the adulterants in milk and milk products

Adulteration in spices and additives: Common adulterants in spices and food additive. Household and laboratory scale methods to detect the adulterants in these commodities.

Unit III

Food Laws and standards for adulteration: Various food standards and international agencies for food standards (Codex Alimentarius Commission, ISO, HACCP, FAO, FDA etc.) National and international Laws and regulations to minimize adulteration in food commodities.

Unit IV

Public health hazards and food safety: Food borne illness, food poisoning, types of food poisonings, bacterial agents of food borne illness,

Food poisoning: Food poisoning by *Clostridium, salmonella, E. coli, Staphylococcus*. etc.

References books:

1. N. Shakuntala Manay and M. Shadaksharaswamy (2008) Food Facts and Principles
2. Frank Weiss Food Adulteration
3. Edwin M. Bruce Edwin M Bruce Detection of the Common Food Adulterants
4. Shyam Narayan Jha (2016) Rapid Detection of Food Adulterants and Contaminants

Food Microbiology

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-301A- Food Microbiology (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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.

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

UNIT-II

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

Fermentation: definition and types, microorganisms used in food fermentations, fermentated 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:

1. Frazier WC and Westoff DC "Food Microbiology" 4th edition Tata Mcgraw-Hill Publishing
2. Jay JM "Modern Food Microbiology" 3rd edition CBS Publishers and distributors Delhi 1987
3. Adams MR and MossMO "Food microbiology" New Age International (P) Ltd. 1996
4. Gunasekaran P. "Laboratory Manual in Microbiology", New Age International (P) Ltd. 1996.

BFST-301B- Principles of Food Microbiology (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 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.

Technology of Fruits & Vegetables

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-302A- Technology of Fruits & Vegetables (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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: Classification, chemical composition and nutritive value of fruits and vegetables.

Unit operations in fruit and vegetable processing: 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). Processing of squashes, cordials, nectars, concentrates and powder.

Preservation of fruit juices: pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation etc.

.

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: types of spoilage in canned foods, methods to control the spoilage of canned foods.

Books Recommended:

1. Preservation of fruits and vegetables by GirdhariLal, Sidappa G S and Tandon G L, 1960, ICAR, New Delhi.
2. Food facts & principles by ShanuntalaManay N &Shadoksharaswamy N, 1996, New Age World Publisher, CA.
3. Food Science by Potter, N.N., CBS Publisher, New Delhi

BFST-302B- Technology of Fruits & Vegetables (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 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.

Food Engineering

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-303A- Food Engineering (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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

Basics of Food Engineering

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

Basic Unit Operations

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 constantnrate 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 and Material Handling Process

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,

Psychrometery: 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 and thermal process calculations

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:

1. Fundamentals of Food Process Engineering by R.T. Toledo (3rd Edition), Springer (2008).
2. Introduction to Food Process Engineering by P.G. Smith, (2nd Edition), Springer, (2011).
3. Fundamentals of Food Engineering by D.G. Rao, (Ist Edition) PHI Learing Pvt, Ltd, New Delhi (2010).
4. Introduction to Food Engineering by R.P. Singh & D.R. Heldman (4th Edition) Academic Press (2009).
5. Transport Processes and Unit Operations by C.J. Geankoplis (3rd Edition), Prentice Hall of India Pvt Ltd, New Delhi, (2009).
6. Food Engineering Operations by J.G. Brenan, J.R. Butters, N.D. Cowell and A.E.V. Lilley (3rd Edition, Elsevier Publication, USA (1990).

BFST-303 B- Food Engineering (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

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.

Skill Enhancement Course

BFST-304- Food Fermentation Technology (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4Hrs. Max. Marks: 50

1. Food fermentation technologies.
2. Study of a bio-fermenter: 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

Technology of Milk & Milk Products

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-401A- Technology of Milk & Milk Products (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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.

Properties 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.

Laws and standards for milk and milk products: Common preservatives used in milk and their detection, legal and ISI standards of milk

Recommended Books:

1. Outlines of Dairy Technology by Sukumar De, 1980, Oxford University Press, UK.
2. Milk & Milk Products by Eckles, Combs, Henery C, and Willes C, 1997, Tata McGraw Hill Publishers, USA.
3. Principles of Dairy Processing by Warner JN, 1976, Wiley Science Publishers, USA.

BFST-401 B- Technology of Milk & Milk Products (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4Hrs. 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.

Food Safety & Food Laws

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-402A- Food Safety & Food Laws (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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 to 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:

1. Adam MR and Moss MO. Food microbiology. New Age International (P) Ltd. ND.

2. Jay JM. Modern Food Microbiology. CBS publishers ND.
3. Potter NN. Food Science. CBS Publishers ND.
4. Bhunia AK. Food borne Microbial Pathogens (Mechanism and Pathogenesis). Food Science text series Springer. Food Safety by Ian C Shaw: Publisher Wiley Blackwell.

BFST-402 B- Food Safety & Food Laws (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

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.

Food Analysis & Instrumentation

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-403A- Food Analysis & Instrumentation (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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 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

Rheological and pasting behavious 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

Spectroscopy: 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:

1. AOAC International. 2003. Official methods of analysis of AOAC International. 17th Ed. Gaithersburg, MD, USA, Association of Analytical Communities.
2. Kirk RS & Sawyer R. 1991. Pearson's Chemical Analysis of Foods. 9th Ed. Longman Scientific & Technical.
3. Nielsen S. (Eds.). 1994. Introduction to Chemical Analysis of Foods. Jones & Bartlett.
4. Pomrenz Y & Meloan CE. 1996. Food Analysis - Theory and Practice. 3rd Ed. CBS.
5. Ranganna S. 2001. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw-Hill.

BFST-403 B- Food Analysis & Instrumentation (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

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.

SKILL ENHANCEMENT COURSE

BFST-404 Food Product Development (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4Hrs. 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.

Technology of Egg, Poultry & Meat

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-501A- Technology of Egg, Poultry & Meat (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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

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

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

UNIT-II

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

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

UNIT-III

Meat: 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.

Meat processing: Mechanical deboning of meat, restructured meat products, inter-mediate moisture meats, meat by-products, fermented meat sausages.

Books Recommended:

1. The Meat We Eat by Romans. JR and Costllo 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-501 B- Technology of Meat, Poultry & Egg (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 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

Confectionary & Sugar Technology
(CREDITS: THEORY – 4 PRACTICAL - 2)
BFST-502A- Confectionary & Sugar Technology (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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: 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 Minife, 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-502 B- Confectionary & Sugar Technology (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 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.

Food Plant Hygiene & Sanitation
(CREDITS: THEORY – 4 PRACTICAL - 2)
BFST-503A- Food Plant Hygiene & Sanitation (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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, 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.

Water Hygiene: potable water supply and its quality standards. Planning and implementation of training programmes for health personnel.

UNIT-IV

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

Training programmes: Planning and implementation of training programmes for food handlers and health personnels, 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 Noistrand

BFST-503 B- Food Plant Hygiene & Sanitation (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 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.

Basic Concepts of Nutrition

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-504A- Basic Concepts of Nutrition (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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

Basic Terminology: Definition, scope and history of nutrition, water balance and energy balance.
Dietary importance of major food constituents: 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: definition, concept and role in controlling various diseases.

UNIT-III

RDA: Recommended daily allowances and requirement of infants, children, adults, old people, Athletes, expectant and nursing mothers.
Diet planning: concept, Diet surveys and diet groups, food exchange list.

UNIT-IV

Therapeutic Nutrition: Importance of therapeutic nutrition, deficiency diseases and disorders of metabolism.
Diet planning for specific group of people: 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 3rdMEdition. 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-504 B- Basic Concepts of Nutrition (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 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. Preperation of nutritious snacks using various methods of cooking.
7. Nutritional labeling of food products.
8. Estimation of BMI and other nutritional status parameters.

Bakery Technology

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-505A- Bakery Technology (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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

Bakery Industry: Current status, growth rate, and economic importance of Bakery Industry in India.

Product Specifications: Product types, nutritional quality and safety of products, applicable standards & regulations.

UNIT II

Bread, Buns and Pizza Base: Ingredients & their role. Manufacturing processes for breads, buns, pizza base, Equipment used.

Quality Parameters: Product quality characteristics of breads, buns, pizza base, defects and corrective measures in these products

UNIT III

Cakes: Ingredients & processes for cakes, Equipment used, product quality characteristics, defects and corrective measures. Different types of icings.

Breakfast Cereals, Macaroni Products and Malt: Production and quality of breakfast such as cereals, macaroni products and malt.

UNIT IV

Biscuits, Cookies & Crackers: Ingredients & processes, Equipment used, product quality characteristics, defects and corrective measures.

Modified Bakery Products:Modification of bakery products for people with special nutritional requirements e.g. high fibre, low sugar, low fat, gluten free bakery products.

Recommended Readings:

1. Dubey, S.C. (2007). Basic Baking 5th Ed. Chanakya Mudrak Pvt. Ltd.
2. Raina et.al. (2003). Basic Food Preparation-A complete Manual. 3rd Ed. Orient Longman Pvt. Ltd.
3. Manay, S. & Shadaksharaswami, M. (2004). Foods: Facts and Principles, New Age Publishers.
4. Barndt R. L. (1993). Fat & Calorie – Modified Bakery Products, Springer US.
5. Samuel A. Matz (1999). Bakery Technology and Engineering, PAN-TECH International Incorporated.
6. Faridi Faubion (1997). Dough Rheology and Baked Product Texture, CBS Publications.
7. Samuel A. Matz (1992). Cookies & Cracker Technology, Van Nostrand Reinhold

BFST-505 B- Bakery Technology (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

1. Preparation of pizza base and assessment of its quality
2. Preparation of bread and assessment of its quality
3. Preparation of buns and assessment of quality
4. Preparation of butter cake and assessment of its quality.
5. Preparation of sponge cake with icing and assessment of its quality.
6. Preparation of cookies and assessment of quality.
7. Preparation of biscuits and assessment of quality.

Basic Concepts of Oils & Fats

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-506A- Basic Concepts of Oils & Fats (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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

Basic concept: Introduction to oils and fats and their nomenclature and classification. Physical, chemical and functional properties of fats and oils.

Dietary importance and requirements: Nutritional importance of oils and fats. Daily requirements of oils and fats, health benefits of oils and fats.

UNIT-II

Source and physico-chemical properties:

Source and physico-chemical properties of following oils:-

Animal sources: Butter oil, lard and tallow.

Plant sources: Groundnut, Sunflower, Soybean and Coconut oil.

Oil extraction: Extraction of oils/fats, basic concepts and principle, various techniques of fat extraction, their advantages and limitations.

UNIT-III

Refining: degumming, choice of alkali, batch and continuous refining.

Bleaching: choice of adsorbent, batch and continuous bleaching.

Deodorization: process parameters: batch and continuous processing.

Problems during storage: rancidity & reversion: Types and their control.

UNIT-IV

Hydrogenation of oils: mechanism, process parameters and batch processing. Fractionation and winterization of oils.

Applications of oils and fats in foods processing: Frying, Cooking, Baking.

By products of oil processing: soap and lecithin.

Recommended Books:

1. Food Chemistry by Meyer LH, 2006, CBS Publisher, New Delhi.
2. Food Science by Potter NN, 5th Ed, 2006, CBS Publisher, New Delhi.
3. Food Oils & Fats: Technology, Utilization and Nutrition by Lawson H, 1995, CBS Publisher, New Delhi.

BFST-506 B- Basic Concepts of Oils & Fats (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

1. To determine moisture content of oilseed
2. To determine FFA of oil
3. Determination of Iodine Value, R.M. Value and Polenske Value
4. To determine Saponification value, anisidine value and peroxide value of oil.
5. Determination of melting point of fats.
6. Detection of sesame oil in vanaspati by furfural test.
7. Detection of adulteration with mineral oil, Cotton seed oil or Ground nut oil.
8. Organoleptic evaluation of fats and oils
9. Visit to vegetable oils industry.

Skill Enhancement Course

BFST-507- Home Based Food Business Development (Theory)

Credits: 2 Duration of exam: 3 Hrs.
Periods per week: 2 Hrs Max. Marks: 50
Theory: 30 IA: 20

Note for the paper setter: The question paper will consists 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 Service: Introduction to food business, Factors contributing to the growth of food service industry

Types and example: Kinds of home based food service establishments. Example of few successful home based food businesses.

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 management: Money, Manpower and Time management to establish home based food business;

Machinery management: Facilities and equipment requirements and their 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 and Project Proposal

Recommended Books:

1. West B Bessie & Wood Levelle.Food Service in Institutions 6th Edition Revised By
2. Hargar FV, Shuggart SG, & Palgne Palacio June, Macmillian Publishing Company New York. 1988.

3. Sethi Mohini . Institution Food Management New Age International Publishers. 2005.
4. Knight J B & Kotschevar LH. Quantity Food Production Planning & Management 3rd edition John Wiley & Sons. 2000.
5. Philip E Thangam. Modern Cookery for teaching and Trade Part I & II Orient Longmam. 2008.
6. Taneja S and Gupta SL. Enterpreneurship development, Galgotia Publishing. 2001.

Food Additives

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-601 A- Food Additives (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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, funtions 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.

Nutritive and non-nutritive sweeteners: their properties, uses and applications in foods.

Acidulants and pH controlling agents: acids, bases and buffers (properties and uses in foods).

UNIT-III

Emulsifiers/surface active agents, Stabilizers, Thickerners, 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

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:

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

5. John M. deMan (1999). Principles of Food Chemistry (3rd edition). Aspen Publishers, Inc. Gaithersburg, Maryland.
6. Purseglove, J.W.(1998). 'Spices' (Vol. I and II). Longman Publishers.
7. Tainter, D.R. and Grenis, A.T. (1993). Spices and Seasonings – A Food Technology Handbook. VCH Publishers, Inc.
8. Farrell, K.T. (1985). Spices, Condiments and Seasonings. AVI Publishing, Inc.

BFST-601 B- Food Additives (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. Max. Marks: 50

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. Detection of adulteration in milk.
6. Detection of adulteration in cereals.
7. Detection of adulteration in oils & fats
8. Detection of adulteration in spices.

Food Grain Storage

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-602 A- Food Grain Storage (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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:

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

BFST-602 B- Food Grain Storage (Practical)

Credits: 2 | Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. | Max. Marks: 50

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.

Nutraceuticals & Functional Foods

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-603 A- Nutraceuticals & Functional Foods (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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.

Legal aspects on functional and nutraeutical foods: Regulatory system for functional foods

and nutraeuticals; safety issues and functional food regulations in India and International regulations. Functional foods available in the market.

Recommended books:

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

BFST-603 B- Nutraceuticals & Functional Foods (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. 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. Exraction 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.

Food Packaging

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-604 A- Food Packaging (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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

1. Food Packaging Materials – M. T. Crospy.
2. Food Packaging Materials – M. Mahadevish R.V. Gowramma.
3. Food Packaging – Stanley Sacharow
4. Food Packaging –Principles & Practices - Gordon L. Robertson
5. A Handbook of Food Packaging, Frank – A – Paine, Heather Y. Paine

BFST-604- B- Food Packaging (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 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.

Food Plant Layout

(CREDITS: THEORY – 4 PRACTICAL - 2)

BFST-605 A- Food Plant Layout (Theory)

Credits: 4 Duration of exam: 3 Hrs.
Periods per week: 4 Hrs. Max. Marks: 100
Theory: 80 IA: 20

Note for the paper setter: The question paper will consists 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,

Site selection: plant site selection guide. Importance of a plant layout and 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 plan 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:

1. Principle of Food Sanitation by Marriott, 5th Ed., 2006, CBS Publishers, New Delhi.
2. Food Processing Waste Management by Green JH and Kramer A, 1979, AVI Publishers, USA.
3. Food Science by Potter NN, 5th Ed., 2006, CBS Publishers, New Delhi.
4. Plant layout and material handling by Sharma S.C.
5. Plant layout & design by James Moore.
6.

BFST-605 B- Food Plant Layout (Practical)

Credits: 2 Duration of exam: 6 Hrs.
Periods per week: 4 Hrs. 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.

SKILL ENHANCEMENT COURSE

BFST-607 Entrepreneurial Development (Theory)

Credits: 2 Duration of exam: 3 Hrs.
Periods per week: 2 Hrs. Max. Marks: 50
Theory: 30 IA: 20

Note for the paper setter: The question paper will consists 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

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:

1. Vasant Desai (2012) Fundamentals of Entrepreneurship and Small Business Management, Himalya Publishing House Pvt. Ltd., Mumbai
2. Vasant Desai (2011) The Dynamics of Entrepreneurial Development and Management Himalya Publishing House Pvt. Ltd., Mumbai
3. D. David and S Erickson (1987) Principles of Agri Business Management , Mc Graw Hill Book Co., New Delhi.
4. Acharya S S and Agarwal N L (1987) Agricultural Marketing in India, Oxford & ISH Publishing Co., New Delhi.
5. David H. Holt (2002) Entrepreneurship – Anew Venture Creation, Prentice Hall of India, New Delhi.
6. Phill Kottler (1994) Marketing Management, Prentice Hall of India Private Limited, New Delhi.
7. Chandra, Prasanna (1996) Projects, Planning, Analysis, Selection, Implementation and Review, Tata McGraw-Hill Publishing Company Limited, New Delhi.