Diploma in Food Processing & Preservation

B. Sc. Food Science and Technology (3rd Semester) w.e.f. 2023-24 onwards								
Sr. No.	**Subject**	**Course ID**	**Credits**	**Contact Hours per week**	**Internal Assessment (IA)***	**External Exam**	**Maximum Marks**	**Duration of Exam (hours)**
1.	Basics Concepts of Food and Nutrition (T)	BSc/FST/SM/3/DSC/201	3	3	25	50	75	3
	Basics Concepts of Food and Nutrition (P)		1	2		25	25	3
2.	Basics of Oils and Fats (T)	BSc/FST/SM/3/DSC/202	3	3	25	50	75	3
	Basics of Oils and Fats (P)		1	2		25	25	3
3.	A Grain Structure and Composition (T)/	BSc/FST/ SM /3/MIC/201A	3	3	25	50	75	3
	A Grain Structure and Composition (P)/		1	2		25	25	3
	B Classification & Structure of Fruits and Vegetables (T)	BSc/FST/ SM /3/MIC/201B	3	3	25	50	75	3
	B Classification & Structure of Fruits and Vegetables (P)		1	2		25	25	3
4.		CDLU/FST/3/MDC/201	3	3	25	50	75	3
5	Fermentation Technology	CDLU/FST/3/SEC/201	3	3	25	50	75	3
6		BSc/FST/SM /3/AEC/201	2	2	20	30	50	2
7		BSc/FST/SM /3/VAC/201	2	2	20	30	50	2
Total			**22**	**25**	**165**	**385**	**550**	

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B. Sc. Food Science and Technology (4th Semester) w.e.f. 2023-24 only								
Sr. No.	**Subject**	**Course ID**	**Credits**	**Contact Hours per week**	**Internal Assessment (IA)***	**External Exam**	**Maximum Marks**	**Duration of Exam (hours)**
1.	Food Engineering (T)	BSc/FST/SM/4/DSC/203	3	3	25	50	75	3
	Food Engineering (P)		1	2			25	3
2.	Food Safety & Food Laws (T)	BSc/FST/SM/4/DSC/204	3	3	25	50	75	3
	Food Safety & Food Laws (P)		1	2			25	3
3	Food Biotechnology (T)	BSc/FST/SM/4/DSC/205	3	3	25	50	75	3
	Food Biotechnology (P)		1	2			25	3
4	Nutraceuticals & Functional Foods (T)	BSc/FST/SM/4/DSC/206	3	3	25	50	75	3
	Nutraceuticals & Functional Foods (P)		1	2			25	3
5	A Milling of Cereals & Millets (T)	BSc/FST/SM/4/MIC/202 A	3	3	25	50	75	3
	A Milling of Cereals & Millets (P)		1	2			25	3
	B Unit Operations in Fruits & Vegetables Processing (T)	BSc/FST/SM/4/MIC/202 B	3	3	25	50	75	3
	B Unit Operations in Fruits & Vegetables Processing (P)		1	2			25	3
6.		AEC	2	2	20	30	50	2
7.		VAC	2	2	20	30	50	2
Total			**24**	**29**	**165**	**310**	**600**	

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B. Sc. Food Science and Technology (5th Semester) w.e.f. 2022-23 & 2023-24 onwards								
Sr. No.	**Subject**	**Course ID**	**Credits**	**Contact Hours per week**	**Internal Assessment (IA)***	**External Exam**	**Maximum Marks**	**Duration of Exam (hours)**
1.	Food Additives (T)	BSc/FST/SM/5/DSC/301	3	3	25	50	75	3
	Food Additives (P)		1	2			25	3
2	Technology of milk and milk products (T)	BSc/FST/SM/5/DSC/302	3	3	25	50	75	3
	Technology of milk and milk products (P)		1	2			25	3
3	Technology of Cereals & Pulses (T)	BSc/FST/SM/5/DSC/303	3	3	25	50	75	3
	Technology of Cereals & Pulses (P)		1	2			25	3
4	Technology of Beverages (T)	BSc/FST/SM/5/DSC/304	3	3	25	50	75	3
	Technology of Beverages (P)		1	2			25	3
5.	A Bakery Technology (T)	BSc/FST/SM/5/MIC/301 A	3	3	25	50	75	3
	A Bakery Technology (P)		1	2			25	3
	B Fermented and unfermented products From fruits and vegetables(T)	BSc/FST/SM/5/MIC/301 B	3	3	25	50	75	3
	B Fermented and unfermented products From fruits and vegetables (P)		1	2			25	3
6.	Internship		4					
Total			24					

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B. Sc. Food Science and Technology (6th Semester) w.e.f. 2022-23 & 2023-24 onwards								
Sr. No.	**Subject**	**Course ID**	**Credits**	**Contact Hours per week**	**Internal Assessment (IA)***	**External Exam**	**Maximum Marks**	**Duration of Exam (hours)**
1.	Technology of Meat, Fish & Poultry (T)	BSc/FST/SM/6/DSC/305	3	3	25	50	75	3
	Technology of Meat, Fish & Poultry (P)		1	2			25	3
2.	Technology of Fruits & Vegetables (T)	BSc/FST/SM/6/DSC/306	3	3	25	50	75	3
	Technology of Fruits & Vegetables (P)		1	2			25	3
3.	Food Packaging (T)	BSc/FST/SM/6/DSC/307	3	3	25	50	75	3
	Food Packaging (P)		1	2			25	3
4.	Confectionery & Sugar Technology (T)	BSc/FST/SM/6/DSC/308	3	3	25	50	75	3
	Confectionery & Sugar Technology (P)		1	2			25	3
5.	A Technology of breakfast cereals (T)	BSc/FST/SM/6/MIC/302 A	3	3	25	50	75	3
.	A Technology of breakfast cereals (P)		1	2			25	3
	B Quality control and packaging of fruits and vegetables (T)	BSc/FST/SM/6/MIC/302 B	3	3	25	50	75	3
	B Quality control and packaging of fruits and vegetables (P)		1	2			25	3
6.	Food Extrusion Technology (T)	SEC	2	2	20	30	50	2
Total			22					

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Basics Concepts of Food and Nutrition

(CREDITS: THEORY - 03 PRACTICAL - 01)

BSc/FST/SM/3/DSC/201 - Basics Concepts of Food and Nutrition (Theory)

Credits: 03 | Duration of exam: 03 Hrs
Periods per week: 03 Hrs | Max. Marks: 75 Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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.

Obesity- it causes, body composition, weight for height measure, health implication of obesity. BMI and factor affecting BMI.

UNIT-II

Carbohydrates- classification, dietary importance and function of carbohydrates.

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, applications of amino acids.

UNIT-III

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.

Functional foods- concept and categories of functional foods and their importance.

Recommended Books:

1. Food Nutrition: M. Swami Nathan Vol. I, II.
2. Food Science, Nutrition and Safety: Sukhneet Suri and Anita Malhotra. Pearson India Education Services Pvt. Ltd., India.
3. Essentials of Food and Nutrition: Swaminathan
4. Food Science and Nutrition: Sunetra Roday

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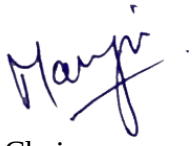
BSc/FST/SM/3/DSC/201 - Basic Concepts of Food and Nutrition (Practical)

Credits: 01 Duration of exam: 03 Hrs

Periods per week: 02 Hrs Max. Marks: 25

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.



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BOS

Basics of Oils & Fats

(CREDITS: THEORY - 03 PRACTICAL - 01)

BSc/FST/SM/3/DSC/202 - Basics of Oils & Fats (Theory)

Credits: 03 Duration of exam: 03 Hrs
Periods per week: 03 Hrs Max. Marks: 75 Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

UNIT-I

Introduction to oils and fats and their nomenclature. Physical and chemical Properties of fats and oils. Nutritional importance of oils and fats.

Source and physico-chemical properties of following oils:-

a) Animal – Butter oil, lard and tallow.
b) Plant – Groundnut, Sunflower, Soybean and Coconut oil.

Extraction of oils/fats.

UNIT-II

Problems during storage – rancidity, reversion.
Refining: degumming, choice of alkali, batch and continuous refining.
Bleaching: choice of adsorbent, batch and continuous bleaching.
Deodorization: process parameters: batch and continuous processing.

UNIT-III

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

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BSc/FST/SM/3/DSC/202 - Basics of Oils & Fats (Practical)

Credits: 01 Duration of exam: 03 Hrs

Periods per week: 02 Hrs Max. Marks: 25

1. To determine moisture content of oilseeds.
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.

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Grain Structure and Composition

(CREDITS: THEORY - 03 PRACTICAL - 01)
BSc/FST/SM/3/MIC/201 A- Grain Structure and Composition (Theory)

Credits: 03 Duration of exam: 03 Hrs
Periods per week: 03 Hrs Max. Marks:75 Theory:50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

UNIT-I

Cereal, pseudocereals and millet grains and their classification. Legume grains and their classification.

Botanical aspects of cereal, pseudocereals and millets. Physical and thermal properties of different food grains.

Unit-II

Structure and chemical composition of different cereals, pseudoceals and millets. Structure and chemical composition of different legume grains.

Grain grading systems.

Unit-III

Nutritional significance of different cereals, pseudocereals, millets and legumes in human diet. Production and processing scenario of cereals, pseudocereals and legume grains.

Recommended Books:

1. Technology of Cereals: N.L. Kent, A.D. Evers. Elsevier Science Ltd.
2. Handbook of Postharvest Technology. Amalendu Chakraverty, Arun S. Mujumdar,G.S. Vijaya Raghavan. Hosahalli S. Ramaswamy. Marcel Dekker Inc., New York.

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BSc/FST/SM/3/MIC/201 A - Grain Structure and Composition (Practical)

Credits: 01 Duration of exam: 03 Hrs

Periods per week: 02 Hrs Max. Marks: 25

1. Identification of different cereal grains grains.
2. Identification of different millets grains.
3. Identification of different legume grains.
4. Proximate analysis of different cereals, millets and leumes grains.
5. Preparation of charts for different cereals and legumes grain production.
6. Determination of physical properties of different food grains.

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Classification & Structure of Fruits and Vegetables
(CREDITS: THEORY - 03 PRACTICAL - 01)
BSc/FST/SM/3/MIC/201 B- Classification & Structure of Fruits and Vegetables (Theory)

Credits: 03 Duration of exam: 03 Hrs
Periods per week: 03 Hrs Max. Marks: 75 Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

Unit-I

Introduction: Chemical composition and nutritive value of fruits. Basic differences between fruits and vegetables.

Classification of fruits and vegetables on the basis of region, structure and ripening behavior.

Unit-II

Sorting and grading of fruits and vegetables.

Maturity and quality grades for fruits and vegetables

Botanical aspects of fruits and vegetables.

Unit-III

Vegetables as a source of nutrients and bioactive compounds.

Aspects of genetically modified fruits and vegetables.

Recommended books:

1. Handbooks of Vegetable Preservation and Processing. Y.H. Hui and E. Ozgul Evranuz. CRC Press.
2. Processing Fruits. Diane M. Barrette, Laszlo Somogyi and Hosahalli Ramaswamy. CRC Press.
3. Handbook of Postharvest Technology. Amalendu Chakraverty, Arun S. Mujumdar,G.S. Vijaya Raghavan. Hosahalli S. Ramaswamy. Marcel Dekker Inc., New York.

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BSc/FST/SM/3/MIC/201 B- Classification & Structure of Fruits and Vegetables (Practical)

Credits: 01 Duration of exam: 03 Hrs.

Periods per week: 02 Hrs. Max. Marks: 25

1. Identification and botanical description of different fruits.
2. Identification and botanical description of different vegetables.
3. Grading of fruits and vegetable according to their size and shape.
4. Identification of primary utilizable parts of fruits and vegetables according to their processing.
5. Identification of utilizable by waste parts of fruits and vegetables according to their processing.
6. Visit of fruits and vegetable processing industry.

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Health & Nutrition

CREDITS: (THEORY - 3)
CDLU/FST/3/MDC/201 Health & Nutrition (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs. Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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.
Fat- functions of fats, cholesterol, LDL & HDL and their health importance.

UNIT-III

Protein - nature and function of proteins, biological value, net protein utilization, protein efficiency ratio, dietary importance and function of Proteins.
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.

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Fermentation Technology

(CREDITS: THEORY -03)

CDLU/FST/3/SEC/201- Fermentation Technology (Theory)

Credits: 03 Duration of exam: 3 Hrs
Periods per week: 03 Hrs Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

UNIT-I

Introduction to fermentation, Fermentation an ancient tradition, Developments in fermentation technology, Scope and future prospects of fermentation microbiology, Gaden's fermentation classification, Rate of microbial growth and death, Rate of Product formation, Classification of food fermentations - Alcoholic, lactic and acetic acid fermentations

UNIT-II

General methods of fermentation – Aerobic fermentation, Anaerobic fermentation, Solid state
fermentation, and submerged fermentation, Batch and continuous fermentation. Pre-requisite for Industrial fermentation process,

UNIT -III

Component parts of a fermentor and their functions, Peripheral parts and accessories of a fermentor, Online and off-line devices of fermentor, Biosensors in fermentation monitoring, Common measurement and control systems in fermentor, Contamination problems in fermentation process, Computer applications in fermentation process.

Recommended Books:

1. Principles of Fermentation Technology by Stanbury and Whittaker
2. Biotechnology: Food Fermentation by VK Joshi & Ashok Pandey
3. Comprehensive Biotechnology by Moo and young (4 volumes)

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Food Engineering

(CREDITS: THEORY – 3 PRACTICAL - 1)
BSc/FST/SM/4/DSC/203 - Food Engineering (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs. Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

UNIT-I

Units and Dimensions: Fundamental and derived units, system of measurement, brief introduction to dimensions.

Material Balance & Energy Balance Calculations: General principles, steady state and unsteady state problems

Screening: Screening terminology, types of screens, effectiveness of screens

Material Handling Process: Introduction, Types of conveyors and application in food industry.

UNIT-II

Mixing: Theory, measurement of mixing, rates of mixing, types of mixers

Sedimentation: Theory, free and hindered settling, sedimentation equipments.

Filtration: Theory of filtration, filtration equations for constant pressure and 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

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.

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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).

BSc/FST/SM/4/DSC/203 Food Engineering (Practical)

Credits: 1 Duration of exam: 3 Hrs.

Periods per week: 2 Hrs. Max. Marks: 25

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

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Food Safety & Food Laws

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/4/DSC/204 - Food Safety & Food Laws (Theory)

Credits: 3 Duration of exam: 3 Hrs.
Periods per week: 3 Hrs. Max. Marks: 75
Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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), Microbiological hazards (Bacterial and Fungal).

UNIT-II

Introduction to food acts, laws and standards: Food safety and standard act. Indian Standards: Agmark Standards. International Standards: Codex Standards, ISO Standards.

Regulatory agencies: Food Safety and Standards Authority of India (FSSAI), The Export Inspection Council, Food and Agriculture Organization (FAO),

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.

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.

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BSc/FST/SM/4/DSC/204 - Food Safety & Food Laws (Practical)

Credits: 1 Duration of exam: 3 Hrs.

Periods per week: 2 Hrs. Max. Marks: 25

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.

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Food Biotechnology

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/4/DSC/205- Food Biotechnology (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs. Max. Marks: 75

Theory:50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

Unit I

Introduction to food Biotechnology: Introduction to Food biotechnology, basic principles ofgenetic engineering,

Genetic engineering and food safety: Improvement of the processing of various crops bygenetic engineering, food safety and biotechnology.

Unit II

Biotechnology and Food ingredients: Biogums, fats, oils, fatty acids and oilseed crops, fat substitutes, natural and modified starches, citric, fumaric and malic acids.

Unit III

Food Biotechnology and Intellectual Property Rights (IPR): benefits of securing IPRs; bioethics in food biotechnology

Transgenic plants and animals: their contribution to food production enhancement.

Suggested Readings:

1. Lee, B.H. (1996). Fundamentals of Food Biotechnology , VCH Publishers.
2. Tombs, M.P. (1991). Biotechnology in Food Industry , Open University Press , MiltonKeyness.
3. Knorr, D .(1987). Food Biotechnology , Marcel Dekker , INC , new yark.
4. Schwartzberg, A & Rao (1990) . Biotechnology & Food Process Engineering , MarcelDekker , INC , New York.
5. Goldberg, I & Williams , R . (1991) .Biotechnology and food Ingredients , Van NostrandReinhold , New York.
6. King , R . D. and Cheetham , P.S.J. (1986)). Food biotechnology , Elsevier AppliedScience, London.
7.

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BSc/FST/SM/4/DSC/205- Food Biotechnology (Practical)

Credits: 1 Duration of exam: 3 Hrs.

Periods per week: 2 Hrs. Max. Marks: 25

1) Ammonium sulphate precipitation of proteins
2) Discontinuous native and SDS PAGE
3) Immunological assay (ELISA) and Demo of Gel Filtration Chromatography/ IEC
4) Enzyme assay and factors affecting with kinetic study
5) Application of enzyme in Fruit processing, and inactivation of enzyme by blanching
6) Preparation of media, sterilization, serial dilution, plating, enumeration, Gram staining
7) Estimation of antioxidant value by ABTS/ FRAP

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Nutraceuticals & Functional Foods

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/4/DSC/206- Nutraceuticals & Functional Foods (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs. Max. Marks: 75

Theory:50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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.

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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. (2nd edition) CRC Press. Boca Raton, London, New York, Washington, D.C.

BSc/FST/SM/4/DSC/206 Nutraceuticals & Functional Foods (Practical)

Credits: 1 Duration of exam: 6 Hrs.

Periods per week: 2 Hrs. Max. Marks: 25

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.

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Milling of Cereals & Millets

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/4/MIC/202 A Milling of Cereals & Millets (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs. Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

UNIT-I

Wheat:

Wheat milling – general principles and operation; cleaning, conditioning and roller milling systems.Flour extraction rates and various flour grades.Criteria of flour quality

Modren and tradition mills. Wheat flour types and usage.

Wheat Flour improvers and Bleachers: their principle and action. Quality criteria for wheat flour.

UNIT-II

Rice:

Milling of rice–types of rice mill; huller mill, Sheller-cum-cone polisher mill. Modern rice milling unit operation-dehusking, paddy separation, polishing and grading. Factors affecting rice yield during milling. By-products of rice milling.

Riceparboiling technology. CFTRI process of parboiling. Properties of parboiled rice, Changes during parboiling. Advantages and disadvantages of parboiling

UNIT-III

Corn Technology: Wet and dry milling of corn, products of wet and dry milling of corn, Corn sweeteners and their uses.

Malt Technology: Malting of barley: steeping, germination and drying. Different types of malts and their food applications.

Recommended Books:

1. Samuel, A.M.(1996) " The Chemistry and Technology of Cereals as Food and Feed ", CBS Publisher & Distribution, New Delhi.

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2. Pomeranz, Y.(1998) " Wheat : Chemistry and Technology", Vol 1,3" Am. Assoc. Cereal Chemists. St. Paul, MN, USA.
3. Eliasson, A.C. and Larsson, K.(1993) "Cereals in Bread making", Marcel Dekker. Inc. NewYork.
4. Honeney, R.C.(1986) "Principles of Cereal Science and Technology", Am. Assoc. Cereal Chemists, St. Paul, MN, USA.
5. Pomeranz, Y. (1976) "Advances in Cereal Science and Technology", Am. Assoc. Cereal Chemists St.Paul, MN, USA.
6. Juliano, B.O.(1685). "Rice Chemistry and Technology", Am. Assoc. Cereal Chemists, St. Paul, MN, USA.
7. Blanshard J.M.V., Frazier, P.J. and Galliard, T. Ed. 1986. Chemistry and Physics of Baking. Royal Society of Chemistry, London.
8. Chakraverty, A. 1988. Postharvest Technology of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi.
9. Durbey, S.C. 1979. Basic Baking: Science and Craft. Gujarat Agricultural University, Anand (Gujrat).
10. Kent, N.L. 1983. Technology of Cereals. 3rdEdn. Pergamon Press, Oxford, UK.
11. Mathews, R.H. Ed. 1989. Legumes: Chemistry, Technology and Human Nutrition. Marcel Dekker, New York.
12. Salunkhe, D.K., Kadam, S.S. Ed. 1989. Handbook of World Food Legumes: Chemistry, Processing and Utilization, (3 vol. set). CRC Press, Florida.

BSc/FST/SM/4/MIC/202 A Milling of Cereals & Millets (Practical)

Credits: 1 Duration of exam: 3 Hrs.
Periods per week: 2 Hrs. Max. Marks: 25

1. Experimental milling of rice and assessment of presence of head, broken and immature kernels and degree of polish.
2. Experimental parboiling of rice by different methods and evaluation of parboiled rice.
3. Determination of proximate analysis of wheat flour for moisture, ash, protein and fat contents.
4. Determination of wet gluten and dry gluten content of given sample of wheat Flour.
5. Determination of alpha-amylase activity in wheat flour by falling number apparatus.
6. Determination of amylose content of cereal and legume starches by iodine binding method.
7. Isolation of rice starch and its quantification.
8. Determination of different cooking parameters of various rice cultivars.
9. Visit to milling and bakery industry

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(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/4/MIC/202 B Unit operations in Fruits and Vegetable Processing (Theory)

Credits: 3 Duration of exam: 3 Hrs.
Periods per week: 3 Hrs. Max. Marks: 75
Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

UNIT-I

Introduction to fruit and vegetable processing:

Definition and importance of fruit and vegetable processing, Overview of the fruit and vegetable processing industry

Pre-processing operations: Sorting and grading,Washing and cleaning, Peeling and trimming

UNIT-II

Post-harvest handling: Harvesting techniques, Storage and transportation, Ripening and maturation

Processing Techniques for Fruits and Vegetables: Thermal processing: Blanching, Pasteurization, Sterilization. Non-thermal processing: Drying, Freezing, Fermentation

UNIT-III

Preservation techniques: Canning, Pickling, Jam and jelly making. Packaging and labeling: Types of packaging materials, Packaging equipment, Labeling requirements. Waste management and utilization of by-products from post-harvest handling processes.

Recommended Books:

1. Earle, R. L. (2013). *Unit operations in food processing*. Elsevier.
2. Jun, S., & Irudayaraj, J. M. (2008). *Food processing operations modeling: design and analysis*. CRC press.
3. Barrett, D. M., Somogyi, L., & Ramaswamy, H. S. (Eds.). (2004). *Processing fruits: science and technology*. CRC press.
4. Sinha, N. K., Hui, Y. H., Evranuz, E. Ö., Siddiq, M., & Ahmed, J. (2010). *Handbook of vegetables and vegetable processing*. John Wiley & Sons.

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5. Srivastava, R. P., Srivastava, R. P., & Kumar, S. (2005). *Fruit and vegetable preservation: principles and practices*. International Book Distributing Company.

6. Smith, J. S., & Hui, Y. H. (Eds.). (2008). *Food processing: principles and applications*. John Wiley & Sons.

BSc/FST/SM/4/MIC/202 B Unit Operation in Fruits and Vegetables Processing (Practical)

Credits: 1 Duration of exam: 3 Hrs.
Periods per week: 2 Hrs. Max. Marks: 25

1. Extraction of juice from fruits using a hydraulic press or centrifugal extractor.

2. Blanching of vegetables to preserve color and texture.

3. Drying of fruits and vegetables using a dehydrator or oven.

4. Pasteurization of fruit juices to extend shelf life.

5. Canning of fruits and vegetables using a pressure canner or boiling water bath.

6. Fermentation of vegetables to produce pickles or sauerkraut.

7. Freezing of fruits and vegetables using a freezer or liquid nitrogen.

8. Jam and jelly making using pectin and sugar.

9. Enzymatic browning prevention in fruits using ascorbic acid or citric acid.

10. Extraction of essential oils from fruits and herbs using steam distillation.

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Food Additives

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/5/DSC/301- Food Additives (Theory)

Credits: 3 Duration of exam: 3 Hrs.
Periods per week: 3 Hrs. Max. Marks: 75
Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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.

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.

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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.

BSc/FST/SM/5/DSC/301- Food Additives (Practical)

Credits: 1 Duration of exam: 3 Hrs.

Periods per week: 2 Hrs. Max. Marks: 25

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.

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Technology of Milk & Milk Products

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/5/DSC/302- Technology of Milk & Milk Products (Theory)

Credits: 3
Periods per week: 3 Hrs

Duration of exam: 3 Hrs.
Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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.

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.

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BSc/FST/SM/5/DSC/302-- Technology of Milk & Milk Products (Practical)

Credits: 1 Duration of exam: 3 Hrs.

Periods per week: 2Hrs. Max. Marks: 25

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.

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Technology of Cereals & Pulses

CREDITS: (THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/5/DSC/303 Technology of Cereals & Pulses (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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

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

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.

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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.

BSc/FST/SM/5/DSC/303- Technology of Cereals & Pulses (Practical)

Credits:1 Duration of exam: 3 Hrs.
Periods per week: 2 Hrs. Max. Marks: 25

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.

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Technology of Beverage

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/5/DSC/304 Technology of Beverage (Theory)

Credits: 3 | Duration of exam: 3 Hrs.
Periods per week: 3 Hrs | Max. Marks: 75
Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

Unit I

Beverages: Definition, types, importance of beverages in our diets.Treatment of water for food industry.

Technology of alcoholic beverages: Wine, cider, brandy, Perry, toddy, bear and whisky.

Unit II

Manufacturing of carbonated beverages and technology of carbonation.

Technology of soft drinks, ingredients and additives used in production of soft drinks.

Citrus beverages, whey beverages and utilization of whey in development of fortified drinks, use oflow calorie sweeteners in beverages.

Unit III

Production, processing and chemistry of tea manufacturing and types of tea.

Production, processing, roasting and brewing of coffee, soluble coffee, decaffeinated coffee, monsooncoffee, coffee brew concentrate and chicory.

Recommended Books:

1. Tressler, Donald K. and Joslyn, Maynard A. 1971 Fruit and Vegetable Juice processinTechnology,Second Edition. The AVI Pub. Com., Inc. USA.

2. ManayShakuntala N and Shadaksharaswamy, M. Foods : Facts and Principles. 2nd edition New AgeInter. Publishers, New Delhi.

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3. Haard, N.F. and Salunkhe, D.K. 1975. Postharvest Biology and Handling of Fruits and Vegetables.AVI, Westport.
4. Kader, A. A. 1992. Postharvest Technology of Horticultural Crops, 2nd Ed. University ofCalifornia, Division of Agriculture and National Resources, California

BSc/FST/SM/5/DSC/304 Technology of Beverage (Practical)

Credits:1 Duration of exam: 3 Hrs.

Periods per week: 2 Hrs. Max. Marks: 25

1. Determination of water quality parameters for beverage industry:

   i. Hardness of water
   ii. Determination of pH
   iii. Microbiology of water

2. Determination of quality parameters for alcoholic and non-alcoholic beverages.

3. Extraction and clarification of juices from different sources.

4. Extraction and debittering of citrus juice.

5. Evaluation of quality testing parameters of wines.

6. Chemical and sensory quality analysis of soft drink.

7. Preparation of whey based beverages.

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Bakery Technology
(CREDITS: THEORY - 03 PRACTICAL - 01)
BSc/FST/SM/5/MIC/301 A - Bakery Technology (Theory)

Credits: 03 Duration of exam: 03 Hrs
Periods per week: 03Hrs Max. Marks: 75 Theory:50 IA:25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

Unit-I

History of Bakery - Present Trends - Prospects - Nutrition facts of Bakery goods

Raw materials used in Bakery - Flour - Types of flour - Flour characteristics - Water - Sources - Functions - Usage of Water; Salt - Role of Salt

Yeast, Yeast Production - Enzymes - their functions in dough

Sugar and Milk - Properties and Role of milk and Sugar in Bakery

Different Leavening agents - their functions in Baking Industry

Spices used in baking and their functions

Flavoring - Nuts and fruits - their function in bread making

Food colours

Setting materials - types - their function in baking;

Unit-II

Bakery unit operations including mixing - fermentation - Proofing - baking

Formula construction and computation of yeast raised products; types of breads, bread faults and remedies.

Setting up of a Bakery Unit - Bakery equipment required - types - Selection - Maintenance - Bakery norms and Standards

Unit-III

Biscuits - Ingredients - Types of biscuits - Processing of biscuits - faults & Remedies

Cream crackers, soda crackers, wafer biscuits & matzos, puff biscuits

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Hard sweet, Semi Sweet and Garibaldi fruit sandwich biscuit

Short dough biscuits, Wafers.

Cakes - types - Ingredients - Processing of cakes - Problems - Remedies

Pizza and pastries - their ingredients and Processing

Suggested readings:

US wheat Associates .Baker's Handbook on Practical Baking .

John Kingslee .A Professional Text to Bakery and Confectionery. New Age International, New Delhi.

BSc/FST/SM/5/MIC/301 A - Bakery Technology (Practical)

Credits: 01 Duration of exam: 03 Hrs
Periods per week: 02Hrs Max. Marks: 25

1. Study of different equipments used in Bakery
2. Estimation of Gluten
3. Determination of alcoholic acidity
4. Determination of falling number/amylase
5. Determination of Pelshenke value
6. Determination of sedimentation value
7. Preparation of bread by straight dough methods
8. Preparation of buns by sponge
9. Preparation of yeast dough products
10. Preparation of soda crackers
11. Preparation of Cakes and Cake decorations, cookies
12. Visit to bakery and confectionery unit

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Fermented and Unfermented Products From Fruits and Vegetables (CREDITS: THEORY - 03 PRACTICAL - 01)

BSc/FST/SM/5/MIC/301 B - Fermented and Unfermented Products From Fruits and Vegetables (Theory)

Credits: 03 Duration of exam: 03 Hrs
Periods per week: 03Hrs Max. Marks: 75 Theory:50 IA:25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

Unit-I

Desirable characteristics of fruits & vegetables for processing. Preparing fruits & vegetables for processing, washing, sorting, grading, peeling, blanching, cutting, destoning and pitting. Canning & Bottling of fruits & vegetables products.

Method of juice extraction, Equipment, preservation and clarification. Squashes & Cordials, Fruit syrups, Nectar. Fruit juice concentrates. Jams, jellies & Marmalades

Unit-II

Fermented products from fruits and vegetables - Vinegar - types of vinegar - methods of vinegar production - Quick method - Orleans slow process - Generator process - problems in vinegar production

Fermented fruit beverages - Wine - types of wines - equipment required - preparation – problems

Sparkling clear wines - Champagne and Cider; Fortified wines - Sherry, vermouths; orange wine, Perry, Tokay, Port

Unit - III

Fermented vegetables - Sauerkraut – pickles - cucumbers Silage – Kimchi and their microbiological spoilages

Fermented and non-fermented pickles,

Cultivated mushrooms: preservation and processing

Definition, Formulation, Preparation & FPO standards of Fruit juices

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Suggested readings

Handbook of Vegetable Preservation and Processing by Y. H. Hui and E. Ozgul Evranuz

Baiely, J.E. and Ollis, D.F. Bio Chemical Engineering Fundamentals (1986), Mcgraw Hills.

Rehm, H.J. and Reed, G. (ed), Biotechnology, Vol 1-2, Verlag chemie. Stanbury, P.E. and Whitaker A., Principles of Fermentation Technology (1984), Prgamon Press. Pirt, S.J.

Principles of Microbial and Cell Cultivation. Blackwell Scientific Publication, London.

Moo-young, M. Comprehensive Biotechnology, Vol. 1-4, Pergamon Press, Oxford.

Industrial Microbiology by Prescott SC & Dunn CG, 2006 CBS Publishers, New Delhi.

Industrial Microbiology by Casida LE,1968, New Age International Publishers Ltd., New Delhi.

BSc/FST/SM/5/MIC/301 B - Fermented and Unfermented Products From Fruits and Vegetables (Practical)

Credits: 01 Duration of exam: 03 Hrs
Periods per week: 02Hrs Max. Marks: 25

1. To study of design of fermentor (batch and continuous for production of yeast)
2. To determine the Dissolved oxygen concentration of fermented broth.
3. To study the production of wine, vinegar, amylase, protease.
4. To study the kinetics of growth of yeast in batch/continuous culture.
5. Preparation of Sauerkraut
6. Preparation of cider
7. Preparation of citrus fruit wine
8. Preparation of grape wine

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Technology of Meat, Fish & Poultry

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/6/DSC/305-- Technology of Meat, Fish & Poultry (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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.

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-II

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-III

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.

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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.

BSc/FST/SM/6/DSC/305-- Technology of Meat, Fish & Poultry (Practical)

Credits: 1 Duration of exam: 3 Hrs.

Periods per week: 2 Hrs. Max. Marks: 25

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.

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Technology of Fruits & Vegetables

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/6/DSC/306- Technology of Fruits & Vegetables (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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

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-III

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

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BSc/FST/SM/6/DSC/306 Technology of Fruits & Vegetables (Practical)

Credits: 1 Duration of exam: 3 Hrs.

Periods per week: 2 Hrs. Max. Marks: 25

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.

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BOS

Food Packaging

(CREDITS: THEORY – 4 PRACTICAL - 2)

BSc/FST/SM/6/DSC/307- Food Packaging (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs. Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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.

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

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BSc/FST/SM/6/DSC/307- Food Packaging (Practical)

Credits: 1 Duration of exam: 3 Hrs.

Periods per week: 2 Hrs. Max. Marks: 25

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 the thermal shock resistance of a glass container.
9. Visit to various industries, dealing with food packaging materials like / paper, board and metal cans.

Chairperson
BOS

Confectionary & Sugar Technology

(CREDITS: THEORY – 3 PRACTICAL - 1)

BSc/FST/SM/6/DSC/308- Confectionary & Sugar Technology (Theory)

Credits: 3 Duration of exam: 3 Hrs.

Periods per week: 3 Hrs Max. Marks: 75

Theory: 50 IA: 25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting 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.

Recommended Books:

1. Chocolate, Cocoa and Confectionary: Science & Technology by Minife, 1997, AVI Publishing Co., New York.

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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.

BSc/FST/SM/6/DSC/308- Confectionary & Sugar Technology (Practical)

Credits: 1 Duration of exam: 3Hrs.

Periods per week:2 Hrs. Max. Marks: 25

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.

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Technology of Breakfast Cereals
(CREDITS: THEORY - 03 PRACTICAL - 01)
BSc/FST/SM/6/MIC/302 A - Technology of Breakfast Cereals (Theory)

Credits: 03 Duration of exam: 03 Hrs
Periods per week: 03Hrs Max. Marks: 75 Theory:50 IA:25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

Unit-I

Breakfast cereals: introduction and classification

Breakfast cereal foods - Flaked breakfast cereals, puffed breakfast cereals, shredded and granular breakfast cereals and cereals puffed by extrusion

Specifications of oatmeals and oatflakes. Flaked products from maize.

Unit-II

Sanitary and quality aspects of breakfast cereal preparations. Nutritional and functional aspects of breakfast cereals.

Unit-III

Breakfast cereals industry and its structure. Recent developments in breakfast cereals cooking, drying and tempering

Future of breakfast cereal industry.

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Suggested readings:

1. Technology of Cereals. by N.L. Kent, 1994

2. Wheat Chemistry and Technology- Pomerenz.

3. Corn chemistry and Technology by Tanley A Watson and Paul E. Ramstad.

4. Legumes: Chemistry, Technology and Human Nutrition by Ruth H. Matthews, 1989.

5. Pulse Chemistry and Technology by B. Tiwari and N. Singh (RSC).

BSc/FST/SM/6/MIC/302 A - Technology of Breakfast Cereals (Practical)

Credits: 01 Duration of exam: 03 Hrs
Periods per week: 02Hrs Max. Marks: 25

1. Processing of oat flakes
2. Preparation of corn flakes
3. Processing of pop corn
4. Processing of puffed rice
5. Processing of flaked rice
6. Processing of cereal and millet malts
7. Visit to rice bran oil extraction industry
8. Visit to a commercial cereal processing unit

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Quality Control and Packaging of Fruits and Vegetables

(CREDITS: THEORY - 03 PRACTICAL - 01)

BSc/FST/SM/6/MIC/302 B - Quality Control and Packaging of Fruits and Vegetables

(Theory)

Credits: 03 Duration of exam: 03 Hrs
Periods per week: 03Hrs Max. Marks: 75 Theory:50 IA:25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

Unit- I

Storage - Factors influencing - Shelf Life of fruits and vegetables - Atmospheric packaging - Respiratory Metabolism

Controlled Atmospheric Packaging Technology (CAP) - Modified Atmospheric Packaging Technology (MAP) - Advantages of CAP and MAP - Effect of gases on MAP foods - N_2 ,O_2 , CO_2

Types of paper - Kraft paper - Bleached paper - Grease proof paper - Glassine paper - Vegetable parchment Waxed paper

Unit-II

Metal canning of fruits and vegetables; types of containers and cans in fruits and vegetables canning

Glass packaging materials for products prepared from fruits and vegetables

Plastic packaging materials for products prepared from fruits and vegetables

Unit-III

Packaging of fruits and vegetables stored at low temperature. Recent advanced techniques in packaging of premium quality fruits and vegetables.

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Suggested Readings:

Crosby NT.1981. Food Packaging: Aspects of Analysis and Migration Contaminants. App. Sci. Publ. Kadoya T. (Ed). 1990.

Food Packaging. Academic Press. Mahadeviah M & Gowramma RV. 1996.

Food Packaging Materials. Tata McGraw Hill. Palling SJ. (Ed). 1980.

Developments in Food Packaging. App. Sci. Publ. Painy FA. 1992.

A Handbook of Food Packaging. Blackie Academic. Sacharow S & Griffin RC. 1980.

Principles of Food Packaging. AVI Publ. Stanley S & Roger CG.1970. Food Packaging. AVI Publ.

G.L. Robertson (2010): Food Packaging and Shelf Life: APractical Guide. CRC Press.

BSc/FST/SM/6/MIC/302 B - Quality Control and Packaging of Fruits and Vegetables

(Practical)

Credits: 01 Duration of exam: 03 Hrs
Periods per week: 02Hrs Max. Marks: 25

1. Classification of various packages based on material and rigidity
2. Prepackaging practices followed for packing fruits and vegetables
3. Measurement of thickness of paper, paper boards
4. Measurement of basic weight of paper and paperboards
5. Measurement of grammage and water absorption of paper, paperboards
6. Measurement of grease resistance of papers
7. Determination of gas transmission rate of package films
8. Determination of WVTR and QTR of films
9. Determination of coating on package materials
10. Identification of plastic films
11. Finding chemical resistance of films
12. Measurement of tensile strength of plastics

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BOS

Food Extrusion Technology

(CREDITS: THEORY - 03)

CDLU/FST/6/SEC/301 Food Extrusion Technology (Theory)

Credits: 03 Duration of exam: 03 Hrs
Periods per week: 03Hrs Max. Marks: 75 Theory:50 IA:25

Note for the paper setter: The question paper will consist of 7 questions in all. The first question will be compulsory and will consist of 4 short questions of 2 marks each covering the whole syllabus. In addition six more questions of 14 marks is will be set unit-wise comprising of two questions from each unit. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.

Unit I

Food Extrusion: Definition, introduction to extruders, principles and types, Uses of extruders in the food industry, Pre-conditioning of raw materials used in extrusion process, Extruder Selection, Design, and Operation for Different Food Applications

Single screw extruder: Principle of working, Operations, manufacturing of pasta and vermicelli

Unit II

Twin screw extruder: Counter rotating and co-rotating twin screw extruder, Process characteristics of the twin screw extruder, Rheological Properties of Materials During the Extrusion Process, Advantages of Twin Screw Extruder.

Effect of extrusion on food products: Chemical and nutritional changes in food during extrusion, factors affecting extrusion, Packaging materials for extruded products

Unit III

Texturized vegetable protein: Definition, Manufacturing process and quality parameters of TVP

Recent Advances in extrusion technology: Carbon dioxide or Nitrogen assisted extrusion technology, Extrusion in confectionary technology, Non-thermal Extrusion of Protein Products

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Suggested Readings:

1. Extruded foods by S. Matza Publisher Springer

2 Technology of Extrusion Cooking by N.D. Frame Publisher Springer

3 Extruders in Food Application by Riaz M.N. Publisher CRC Press

4 Extrusion of Foods by J.M. Harper Publisher CRC Press

5 Advances in Food Extrusion Technology by Maskan and Altan Publisher CRC Pres

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