

SYLLABUS

(APPROVED BY ANDHRA UNIVERSITY)

B.Sc. FOOD TECHNOLOGY

(w.e.f- 2020-21)

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER –I

S.No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	First Language (Telugu/Hindi/Urdu/Sanskrit)	100	25	75	4	3
2	Second Language English	100	25	75	4	3
3	Life Skill Courses (any 1 of 3) HVPE (Human Values & Professional Ethics) / Computer Application/ Entrepreneurship	50	0	50	2	2
+4	Skill Development Course Plant Nursery /Electrical Appliances	50	0	50	2	2
5	DSC-1,Paper-1 (Core) Food chemistry and Biochemistry-1 (THEORY)	100	25	75	4	4
6	DSC-1, Paper-1 Lab Food chemistry and Biochemistry-1 (PRACTICAL)	50	0	50	2	1
7	DSC-1, Paper-2 (Core) Food and Human Nutrition (THEORY)	100	25	75	4	4
8	DSC-1, Paper-2 Lab Food and Human Nutrition (PRACTICAL)	50	0	50	2	1
9	DSC-1, Paper-3 (Core) Food Production Trends (THEORY)	100	25	75	4	4
10	DSC-1, Paper-3 Lab Food Production Trends (PRACTICAL)	50	0	50	2	1
	Total	750	125	625	30	25

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER –II

S.No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	First Language (Telugu/Hindi/Sanskrit/Urdu)	100	25	75	4	3
2	Second Language English	100	25	75	4	3
3	Life Skill Courses (any 1 of 3) Information & Communication Technology (ICT) /Indian Culture and Science/ / Elementary statistics	50	0	50	2	2
4	Skill Development Courses (Any two) 1. Fruit and Vegetable processing	50	0	50	2	2
5	2. Food Adulteration 3. Dairy Techniques	50	0	50	2	2
6	DSC-2, Paper – 1 (Core) Food chemistry and Biochemistry-2 (THEORY)	100	25	75	4	4
7	DSC-2, Paper-1 Lab: Food chemistry and Food Biochemistry-2 (PRACTICAL)	50	0	50	2	1
8	DSC-2, Paper – 2 (Core) Food Microbiology (THEORY)	100	25	75	4	4
9	DSC-2, Paper – 2 Lab: Food Microbiology (PRACTICAL)	50	0	50	2	1
10	DSC-2, Paper – 3 (Core) Applied statistics (THEORY)	100	25	75	4	4
11	DSC-2, Paper – 3: Lab: Applied statistics (PRACTICAL)	50	0	50	2	1
	Total	800	125	675	32	27

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER –III

S. No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hour	Credits
1	First Language (Telugu/Hindi/Sanskrit/Urdu)	100	25	75	4	3
2	Second Language English	100	25	75	4	3
3	Life Skill Courses (one to be selected from 3) 1. Analytical Skills /Personality Development and Leader Ship/Health and Hygiene)	50	0	50	2	2
4	Life Skill Courses 2. Environmental Education	50	0	50	2	2
5	Skill Development Courses Poultry Farming	50	0	50	2	2
6	DSC-3, Paper-1 (CORE) Food Process Engineering-1 (THEORY)	100	25	75	4	4
7	DSC-3, Paper-1 Lab : Food Process Engineering-1 (PRACTICAL)	50	0	50	2	1
8	DSC-3 Paper-2 (CORE) Food Additives (THEORY)	100	25	75	4	4
9	DSC-3, Paper-2 Lab: Food Additives (PRACTICAL)	50	0	50	2	1
10	DSC-3 Paper-3 (Core) Processing and Preservation of Foods-1 (THEORY)	100	25	75	4	4
11	DSC-3, Paper-3 Lab: Processing and Preservation of Foods-1 (PRACTICAL)	50	0	50	2	1
12	Yoga	0	0	0	0	1
	Total	800	125	675	32	28

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER –IV

S. No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	DSC-4, Paper-1 (CORE) Food Process Engineering-2 (THEORY)	100	25	75	4	4
2	DSC-4, Paper-1 Lab: Food Process Engineering-2 (PRACTICAL)	50	0	50	2	1
3	DSC-4, Paper – 2 (CORE) Food Analysis (THEORY)	100	25	75	4	4
4	DSC-2, Paper –2 Lab: Food Analysis (PRACTICAL)	50	0	50	2	1
5	DSC-4, Paper-3 (CORE) Processing and Preservation of Foods-2 (THEORY)	100	25	50	4	4
6	DSC-4, Paper-3 Lab: Processing and Preservation of Foods-2 (PRACTICAL)	50	0	50	2	1
7	DSC-4, Paper 4 (CORE) Food Safety and Quality control (THEORY)	100	25	75	4	4
8	DSC-4, Paper-4 Lab: Food Safety and Quality control (PRACTICAL)	50	0	50	2	1
9	DSC-3 Paper-5 (CORE) Food Trade and Business Management (THEORY)	100	25	75	4	4
10	DSC-4, Paper-5 Lab: Food Trade and Business Management (PRACTICAL)	50	0	50	2	1
11	DSC-4 Paper-6 (CORE) Food Packaging	100	25	75	4	4
12	DSC-4, Paper-6 Lab: Food Packaging (PRACTICAL)	50	0	50	2	1
13	Extension activities	-	-	-	-	2
13	Yoga	-	-	-	-	1
	Total	900	150	750	36	33

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER – V

S. No	Course	Total Marks	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	DSC-5, Paper-1 (SEC-1) Fermentation Technology (Theory)	100	25	75	4	4
2	DSC-5 Paper-1 Lab: Fermentation Technology (PRACTICAL)	50	0	50	2	1
3	DSC-5, Paper-2: (SEC-2) Product development and evaluation (THEORY)	100	25	75	4	4
4	DSC-5, Paper-2 Lab: Product development and evaluation (PRACTICAL)	50	0	50	2	1
5	DSC-5, Paper-3 (SEC-3) Dairy Technology (THEORY)	100	25	75	4	4
6	DSC-5, Paper-3 Lab: Dairy Technology (PRACTICAL)	50	0	50	2	1
7	DSC-5, Paper 4 (SEC-4) Post Harvest Technology (THEORY)	100	25	75	4	4
8	DSC-5, Paper-4 Lab: Post Harvest Technology (PRACTICAL)	50	0	50	2	1
9	DSC-5, Paper-5 (SEC-5) Food Quality and Certification (THEORY)	100	25	75	4	4
10	DSC-5, Paper-5 Lab: Food Quality and Certification (PRACTICAL)	50	0	50	2	1
11	DSC-5, Paper-6 (SEC-6) Baking and confectionery Technology (THEORY)	100	25	75	4	4
12	DSC-5, Paper-6 Lab: Bakery and confectionery Technology (PRACTICAL)	50	0	50	2	1
13	NCC/NSS/SPORTS/EXTRA CURRICULAR	-	-	-	-	2
14	YOGA	-	-	-	-	1
	Total	900	150	750	36	30

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER –VI

(Apprenticeship/ Internship/ Industrial Training)

S.No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	<u>Apprenticeship / Internship in Hospital/Industrial Training/On the job Training</u>	400	0	400	0	12
	TOTAL	400	0	400	0	12

**CBCS/Semester System (2020-21) - I Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-1 Paper-1: FOOD CHEMISTRY AND BIOCHEMISTRY-1 (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable students

To know about various biochemical components of foods and their properties and application in food processing

To study about Classification structure and functions of Carbohydrates.

To know about the importance of Biochemistry of proteins, amino acids and Enzymes.

To know about the importance and application of enzymes in Food processing

To study about classification, structure and functions of important fatty acids.

Unit –I (12 Hours)

Introduction to food chemistry

Approach to the study of Food Chemistry – biochemical changes in foods, moisture in foods, water activity and sorption isotherms, shelf life of foods, Hysteresis. Scope and importance of biochemistry, Biomolecules.

Unit–II (12 Hours)

Colloidal solutions, Definition, classification of colloidal solutions, protective colloids and gold number. Introduction to the proximate composition of foods, official methods for the analysis of foods – AOAC, AACC, AOCS.

Unit-III (12 Hours)

Carbohydrates

Introduction, Classification of Carbohydrates, structure and food sources, chemical properties, functional properties of carbohydrates. Crude fiber, browning reactions in foods, application of stabilizers and thickeners in foods.

Unit – IV (12 Hours)

Lipids

Classification, Sources and Chemistry of lipids – physical properties and chemical properties in foods. Role of fat and applications in food preparation. Shortenings – shortening value and factors affecting it.

Unit-V (12 Hours)

Proteins & Enzymes

Definition, classification, structure of amino acids, Essential and non-essential amino acids, Biologically important proteins, Enzymes, Nomenclature and Classification and functions of enzymes of Enzymes, Holo enzymes, apoenzymes, Co-enzymes & cofactors, mechanism of action, Enzyme Inhibition. Impact of Temperature, P^H, and substrate concentration on enzyme activity, Application of Enzymes in food industry.

Books for Reference:

1. Dr. Ling, H D Belitz, Dr. Ing, W. Grosch, *Food Chemistry*, Springer, Newyork, 1987.
2. Braverman, *Introduction to the Bio-Chemistry of Foods*, Elsevier Scientific Publishing Company.
3. AOAC methods for food analysis.
4. Meyer, *Food Chemistry*, AVI Publishing Company, USA 1983.
5. Sadasivam and Manickyam, *Biochemical Methods*, New Age International Publications, New Delhi, 1996.

**CBCS/Semester System ((2020-21) - I Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-1 Paper-1 Lab: Food Chemistry & Biochemistry-1 (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Laboratory safety Rules and Precautions.
2. To study the development of gluten in various flours.
3. Qualitative tests for mono, di and polysaccharides and their identification in unknown mixtures
4. Quantitative estimation of glucose by Anthrone method
5. Determination of Acid Number in Lipids
6. Qualitative tests for proteins
7. Quantitative estimation of protein by Lowry's Method

RECOMMENDED BOOKS

1. Sadasivam and Manickyam, *Biochemical Methods*, New Age International Publications, New Delhi, 1996.
2. Hawk PB, Oser BL and Summerson WH (1954). *Practical Physiological Chemistry*, Mcgraw Hill, New York.
3. Sundararaj P and Siddhu A (2006). *Qualitative Tests and Quantitative Procedures in Biochemistry*. Elite Publishing House Pvt. Ltd., New Delhi.

**CBCS/Semester System (2020-21) - I Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-1 Paper-2: FOOD AND HUMAN NUTRITION (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: to enable the student

To understand about Nutrition, and importance of food for Health

To analyze about different vitamins and minerals and their importance

To know about Balanced diet and Recommended Daily Allowances

To study about diet surveys and Vitamin Deficiency Control Programmes

To gain knowledge about International agencies like WHO, FAO, UNICEF and CA

Unit – I (12 Hours)

Introduction to human nutrition- basic definition of nutrition, health, nutrients. Principles compounds in foods- classification of foods, sources, functions and deficiency symptoms of carbohydrates, proteins, fat, vitamins and minerals.

Unit – II (12 Hours)

Nutritional requirements for different age groups – infant, pre-school children, school going children, adolescents, adults, old age, pregnancy, lactation and industrial workers; recommended dietary allowances (RDA) for different age groups.

Unit – III (12 Hours)

Classification of foods, their Nutritive value, effect of processing on nutritive value of foods- obesity, food faddism and faulty food habits- toxicants naturally occurring in foods- food adulteration.

Unit – IV (12 Hours)

Food production and consumption pattern in different parts of India – food requirements and availability- applied nutrition programme, diet and nutrition in India.

Unit – V (12 Hours)

Prevention of malnutrition in developing countries- nutritive value of common Indian recipes- therapeutic diets – food allergy- processed supplementary foods and novel foods.

**CBCS/Semester System ((2020-21) - I Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-1 Paper-2 Lab: Food and Human Nutrition-1 (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

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. Estimation of BMI and other nutritional status parameters.
5. Planning meals for adults of different activity levels for various income groups.
6. Survey of locally available foods and identifying the key nutrients
7. Estimation of BMI and other nutritional status parameters.
8. Formulation of weaning foods
9. Planning and preparation of diets for aged people

**CBCS/Semester System - I Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-1 Paper-3: Food Production Trends (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Unit-I (12 Hours)

Status of food processing industry in India & Abroad, Indian food industry, Reasons for slow growth, Scope for Expansion, Future priorities in Food Production need magnitude and Inter Dependence of food production and processing agencies.

Unit-II (12 Hours)

Dairy, Bakery, Confectionary. Beverage and Snack foods and their growth, popularity of Indian foods, National and International Projects and their food products.

Unit-III (12 Hours)

Ministry of food processing industries (MOFPI), objectives and functions, APEDA-its objectives and functions, food characteristics, classification of foods, types of foods, convenience foods - Recent Trends for processing of foods, genetically modified foods.

Unit-IV (12 Hours)

Functional Foods and their advantages and disadvantages, Food Demand and Supply, Factors affecting Food Demand, Food Laws, Factors affecting food laws.

Unit-V (12 Hours)

Global Demand for food, World Food Day, its importance and Action plan. Classification of food crops, food Losses, production and estimation of Post Harvest losses, Development Programmes and strategies to eliminate food losses, Employment Generation, through post harvest operations.

Books for Reference:

1. NN Potter, Food Science III edition,. AVI Publishing co. Inc., west port, USA, 1978.

2. K. Vijaya Raghavan, *Agricultural Administration in India*.
3. Chidda singh, *Modern Techniques of Raising Field crops*, Oxford & IBH Publishing co, New Delhi.
4. Graf and Saguy, *Food product Development*, CBS Publishers, New Delhi.
5. M. Swaminathan, *Food and Nutrition*, Vol I &II, The Bangalore Printing & Publishing co.ltd, Bangalore.
6. Mahatas, S.Banji, N. Prashad Rao and Vinodini Reddy Text Book of *Human Nutrition*, Oxford Publishing Co.Ltd. New Delhi.

**CBCS/Semester System - I Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC – 1 Paper-3 Lab: FOOD PRODUCTION TRENDS (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Preparation of Beverages and comparison with regular beverages commonly found in the market.
2. Identification of food crops according to various categories.
3. Enlist the processed and RTE food products available in the market
4. Processing and production of the products from major food groups.
5. Evaluation of the quality parameters of prepared food product.
6. Preparation of a recipe using functional foods.
7. Estimation of post harvest loss during low temperature storage.

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER –II

S.No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	First Language (Telugu/Hindi/Sanskrit/Urdu)	100	25	75	4	3
2	Second Language English	100	25	75	4	3
3	Life Skill Courses (any 1 of 3) Information & Communication Technology (ICT) /Indian Culture and Science/ / Elementary statistics	50	0	50	2	2
4	Skill Development Courses (Any two) 1. Fruit and Vegetable processing	50	0	50	2	2
5	2. Food Adulteration 3. Dairy Techniques	50	0	50	2	2
6	DSC-2, Paper – 1 (Core) Food chemistry and Biochemistry-2 (THEORY)	100	25	75	4	4
7	DSC-2, Paper-1 Lab: Food chemistry and Food Biochemistry-2 (PRACTICAL)	50	0	50	2	1
8	DSC-2, Paper – 2 (Core) Food Microbiology (THEORY)	100	25	75	4	4
9	DSC-2, Paper – 2 Lab: Food Microbiology (PRACTICAL)	50	0	50	2	1
10	DSC-2, Paper – 3 (Core) Applied statistics (THEORY)	100	25	75	4	4
11	DSC-2, Paper – 3: Lab: Applied statistics (PRACTICAL)	50	0	50	2	1
	Total	800	125	675	32	27

**CBCS/Semester System (2020-21) – II Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-2 Paper-1: FOOD CHEMISTRY AND BIOCHEMISTRY-2 (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

To know about the emulsions, gels and foams and their application in food processing.

To Study about importance of carbohydrate metabolism.

To know about Fats and their Metabolism biologically important fatty acids.

To know about the Fundamental properties of water classification of vitamins and minerals .

Unit –I (12 Hours)

Emulsions: Definition, types, properties, classification of emulsions , emulsifying agents, natural and synthetic emulsifier, functions of emulsifying agent, common food emulsions. Gels, Types of Gels, properties. Theory of gel formation.

Unit–II (12 Hours)

Foams – meaning, methods of foam formation, theory of foam formation, properties – factors influencing foam formation, factors affecting stability of foam, foaming agents – natural and synthetic. gelatinization, retro gradation, dextrinisation of starches, non-enzymatic browning reaction in foods.

Unit-III (12 Hours)

Carbohydrates. Metabolism of carbohydrates: glycolysis, citric acid cycle, ETC HMP shunt pathway, glycogenolysis, glycogenesis, gluconeogenesis

Unit – IV (12 Hours)

Fats & Fat substitutes, Reactive oxygen species, Deterioration of fats/oils, Rancidity, Tests for Rancidity, lipolysis, auto oxidation. Antioxidants-natural and synthetic, their mechanism, Synthesis of even & odd number fatty acids

Unit-V (12 Hours)

Vitamins and minerals: Structure and biochemical role:

Fat soluble vitamins – A, D, Water soluble vitamins – B1, B2, niacin, pyridoxine, folic acid, B12 and C.

Sources ,importance and Biochemical role of iron, calcium, phosphorous, iodine, selenium and zinc

RECOMMENDED READINGS

1. Lehninger A L, Nelson D L and Cox M M (2009). Principles of Biochemistry, 6th Ed. CBS Publishers and Distributors.
2. Murray R.K, Granner D K, Mayes P A and Rodwell V W (2009). Harper's Biochemistry, 28th Ed, Lange Medical Book.
3. John M.Deman, *Principles of Food Chemistry*, Springer International edition, Third edition, 2007.
4. Meenakshipaul, *Experimental Food Chemistry*, Published gene tech books New Delhi, 2012.
5. Fenema. R, Food Chemistry, Fourth edition, CRC Press Taylors and Francis groups.
6. R.P.Srivastava and Sanjeev Kumar, Fruits and Vegetables preservation, principles and practices, International Book Distribution Co. Third revised edition.

**CBCS/Semester System (2020-21) – II Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-2, Paper-1: FOOD CHEMISTRY AND BIOCHEMISTRY-2 (Practical)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Determination of saponification value of Fats/oils.
2. Determination of Iodine Value of Fats/ Oils
3. Estimation of lipids by soxhalet Apparatus.
4. To study the impact of pH, Temperature and Substrate on enzyme activity
5. Estimation of Vitamin C in foods
6. Assay of Amylase
7. Estimation of Pectinases in foods

RECOMMENDED READINGS

1. Nelson DL, Cox MM. 2000. Lehninger Principles of Biochemistry Third (Indian edition) Macmillian, Worth Publishers.

**CBCS/Semester System (2020-21) – II Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-2 Paper-2: FOOD MICROBIOLOGY (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

1. To know the important genera of microorganisms associated with food and their characteristics.
2. To understand the role of microbes in fermentation, spoilage and food borne diseases.
3. To gain knowledge on various methods of cultivation and identification of food microbes.

UNIT 1 (12 Hours)

Introduction to Food Microbiology : Introduction of microbiology and its relevance to everyday life, Inter-relationship of microbiology with other sciences. History and Development of Food Microbiology. Definition and Scope of food microbiology. General characteristics of bacteria, fungi, virus, protozoa, and algae. Beneficial effect of microorganisms.

Characteristics of Microorganisms in Food: Types of microorganisms associated with food, their morphology and structure. Significance of spores in food microbiology.

UNIT2 (12 Hours)

Cultivation of Micro-organisms: Methods of isolation and cultivation, Serial dilution method, Pure culture technique. Enumeration of Microorganisms- qualitative and quantitative.

Microbial Growth in Food: Bacterial growth curve and microbial growth in food. Factors affecting the growth of micro organisms in food, effect of environmental factors in growth of microorganism - pH , water activity , oxygen availability, temperature and others.

UNIT3 (12 Hours)

Microbial Food Spoilage: Sources of Microorganisms in foods. Some important food spoilage microorganisms. Spoilage of specific food groups- Milk and dairy products, Meat, poultry and seafoods, Cereal and cereal products, Fruits and vegetables and Canned products.

UNIT4 (12 Hours)

Foodborne Diseases: Microbial intoxication and infections: Sources of contamination of food, Types – food borne infections, food borne intoxications, symptoms and method of control. Toxins in foods. Common and Recent Examples of Food borne out breaks.

Importance of sanitation and hygiene in relation with spreading of microorganisms.

Relevance of microbiology standards for food safety.

Rapid Methods of detection and recent advances.

UNIT5 (12 Hours)

Control of Microorganisms in Foods: Principles and methods of preservation.

Physical Methods of Food Preservation- Dehydration, Freezing, Cool Storage, Heat Treatment (esp.thermobacteriology), Irradiation, Chemical methods, Biopreservatives esp. Bacteriocins.

Introduction to Hurdle concept and Non Thermal methods.

Recommended Readings

1) Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi,2004

2) Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000

3) Garbutt, John. Essentials of Food Microbiology, Arnold, London, 1997.

4) Banwartt: Food Microbiology

5) Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, New Delhi, 1993.

**CBCS/Semester System (2020-21) -II Semester Syllabus
B.Sc. FOOD SCIENCE AND NUTRITION**

DSC- 2, Paper-2 Lab: FOOD MICROBIOLOGY (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Introduction to Microbiology Laboratory, safety Practices
2. Equipment used in microbiology laboratory.
2. Functioning and use of compound microscope
3. Cleaning and sterilization of glassware
4. Preparation and sterilization of nutrient broth
5. Preparation of slant, stab and plates using nutrient agar
6. Cultivation and sub-culturing of microorganisms
7. Morphological study of bacteria and fungi using permanent slides
8. Simple staining
9. Gram's staining
10. Standard Plate Count Method
11. Visits (at least two) to food processing units or any other organization dealing with advanced methods in food microbiology.

**CBCS/Semester System (2020-21) – II Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-2 Paper-3: APPLIED STATISTICS (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

To understand measures of central tendency and measures of dispersion and its uses.

To know the basic definitions, methods of measures of correlation co-efficient and regression analysis.

To learn small and large sample test in different situations.

To know the difference between two or more means.

To study the basic statistical techniques in relation to food analysis

Unit – I **12 Hrs**

Measures of central tendency- Mean, Mode, median for grouped and ungrouped data, merits and demerits. Measures of dispersion- range, quarterly deviation- mean deviation, standard deviation for grouped and ungrouped data, merits and demerits. Co-efficient of variation- simple problems.

Unit – II **12 Hrs**

Correlation – types of correlation, scatter diagram- Karl Pearson's coefficient of correlation, rank correlation - simple problems
Regression lines- regression equations, fitting of linear regression equation of Y on X and X on Y -Simple problems

Unit – III **12 Hrs**

Sampling – types of sampling- probability and non-probability sampling methods.
Data collection and representation- Primary and secondary data, Diagramatic and graphic representation of Data.
Definition of null hypothesis- alternative hypothesis, type - I and type -II errors-
Level of significance. Tests of significance for large samples, test significance for single mean- Test of significance for difference of means, Test significance for difference of standard deviation- simple problem.

Unit – IV **12 Hrs**

Chi- Square Test- Chi – Square Test for goodness of fit, chi-square test for independence of attributes, yate's correction, T- test: - t- test for single mean, t- test for two means, paired t- Test, t- test for significance of the correlation of coefficient

Unit – V **12 Hrs**

Analysis of Variance, F-Test- analysis of variance- assumptions, ANOVA in one way- Classification, two – way of classification- Simple problems.

References:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical statistics", Sulthan / Chand & Sons, New Delhi. 2002.
2. S.C. Gupta and V.K. Kapoor, "Statistical Methods", Sulthan / Chand & Sons, New Delhi. 2000.
3. V.K. Kapoor "Problems and solution in statistics" 3rd edition Sulthan Chand & Sons, New Delhi. 2000.

**CBCS/Semester System (2020-21) – II Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-2 Paper-3: APPLIED STATISTICS (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Simple random sample, Stratified random sample and Cluster sampling with random allocation.
2. Computation of mean and SD and SE for grouped and ungrouped data.
3. t-test for single and two samples, Paired t-test
4. Problems on Chi-square test.
5. Correlation coefficient and its testing.
6. Analysis of variance and problems on ANOVA
7. Problems on Binomial distribution.

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER –III

S. No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hour	Credits
1	First Language (Telugu/Hindi/Sanskrit/Urdu)	100	25	75	4	3
2	Second Language English	100	25	75	4	3
3	Life Skill Courses (one to be selected from 3) 1. Analytical Skills /Personality Development and Leader Ship/Health and Hygiene)	50	0	50	2	2
4	Life Skill Courses 2. Environmental Education	50	0	50	2	2
5	Skill Development Courses Poultry Farming	50	0	50	2	2
6	DSC-3, Paper-1 (CORE) Food Process Engineering-1 (THEORY)	100	25	75	4	4
7	DSC-3, Paper-1 Lab : Food Process Engineering-1 (PRACTICAL)	50	0	50	2	1
8	DSC-3 Paper-2 (CORE) Food Additives (THEORY)	100	25	75	4	4
9	DSC-3, Paper-2 Lab: Food Additives (PRACTICAL)	50	0	50	2	1
10	DSC-3 Paper-3 (Core) Processing and Preservation of Foods-1 (THEORY)	100	25	75	4	4
11	DSC-3, Paper-3 Lab: Processing and Preservation of Foods-1 (PRACTICAL)	50	0	50	2	1
12	Yoga	0	0	0	0	1
	Total	800	125	675	32	28

**CBCS/Semester System (2020-21) – III Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-3 Paper-1: FOOD PROCESS ENGINEERING-1(THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

To study about units & dimensions.

To learn about the different methods of cereal processing

To study about fluids, how to process the food

To understand about heat transfer, and how many types of processing

To know about drying.

To understand about filtration sedimentation & reverse osmosis

To know different types of equipment used in food processing industries.

UNIT-I (12 Hours)

Unit operations classification, Conservation of mass and energy, SI, FPS and MKS system of units.

Pretreatment unit operations- Cleaning, Dehulling/Dehusking, Peeling, Mixing and Forming, Sorting and Grading, Size reduction and separation.

Introduction to material handling equipment- Material handling machines and conveyors.

UNIT-II (12 Hours)

Introduction and importance of physical properties- size and shape of grains, size and shape of fruits, Bulk density of grains, True density of grains, Porosity, Angle of repose, Test weight, Introduction to thermal, electrical and rheological properties of food, properties of food material and their significance in equipment design, processing and handling of food products.

UNIT-III (12 Hours)

Introduction to heat processing- Blanching, Pasteurization and Sterilization- principles, different methods and equipment. Interaction of heat energy and food components, Introduction to reaction kinetics, Thermal destruction of microorganisms and Thermal destruction of enzymes.

UNIT-IV (12 Hours)

Drying- principles of drying, Thin layer drying and Batch drying, Moisture content- Free moisture, Bound moisture, Equilibrium Moisture Content, Hysteresis, drying curves, Constant rate period, Falling rate period-Water activity, Psychrometry- terms, chart and applications.

Different types of dryers and components- Roller, Spray, Tray, Compartment, Fluidized bed, LSU ,Freeze dryer, Foam mat, Osmotic dehydration – their working principles and applications.

UNIT-V (12 Hours)

Evaporation- types of evaporators- Short tube ,Long tube, Single-effect , Multiple-effect, Vaccum evaporators and their applications, Mass and Energy balance, Fouling of evaporators and heat exchangers.

Concentration-Freeze concentration, Freezing and storage of frozen food, Low temperature preservation, Irradiation of food products- microwave heating, dielectric heating of foods – principles and applications in food industries.

**CBCS/Semester System (2020-21) – III Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-3 Paper-1 Lab: FOOD PROCESS ENGINEERING-1(PRACTICAL))

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

- 1) Determination of Moisture content by hot air oven method
- 2) Determination of particle size distribution using sieve shaker.
- 3) Practical operations- collection of food samples- washing, peeling ,scoring, pitting and blanching.
- 4) Experiments on crystallization.
- 5) Experiments on concentration.
- 6) Study of CIP treatment in Fruits & Vegetables processing plant

**CBCS/SEMESTER SYSTEM- III SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-3 Paper-2: Food additives (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students
To understand various types of additives used in food process
To study about the flavoring agents & nutritional, preservatives.
To know about the food colors & sources.
To understand different aspects of safety and guidelines

Unit-I (12 Hours)

Introduction to Food Additives – Types of additives with examples - benefits of additives - risks of additives, Functions and classification of food additives. Novel foods and aspects of labeling, Food Colors – sources, types with reference to natural & synthetic. Properties, reactions with reference to processing, food applications. Non-permitted colors – risks, health hazards

Unit-II (12 Hours)

Nutritional additives (fortificants/supplements), requirements (RDA and ADI), occurrence & commercial forms of various vitamins & minerals available. Antimicrobial agents – Application of benzoic acid & benzoates, Sorbic acid & sorbates, short chain acids & salts. Antibrowning agents – food applications. Starch modifiers – Chemical nature, their role in food processing. Buffers – acids and alkalies, types and examples

Unit III (12 Hours)

Naturally occurring food additives, classification, role in food processing and health implications. Anti-oxidants and chelating agents, types and examples of anti-oxidants, their role in foods, natural and synthetic anti-oxidants - their mode of action in foods. Food additives and hygiene sensitivity. Applications of antioxidants in food industry.

Unit IV (12 Hours)

Toxicology and Safety evaluation of food additives, beneficial/toxic effects, Generally Recognized As Safe (GRAS), tolerance levels and toxic levels in food.

Methods of estimating dietary intake of food additives. Food additives and hygiene sensitivity. Preservatives - Natural and chemical preservatives and their chemical action on foods and human system.

Unit-V (12 Hours)

Food flavors – natural, nature identical, synthetic. Flavor enhancers, Potentiators & applications. Flavoring materials made by processing. Applications of flavors in food industry.

Books for Reference:

1. AL Branen, Davidson and S. Salminen, *Food Additives*. Marcel Dekker Inc NY 1990.
2. Swaminathan, *Food Science, Chemistry & Experimental Foods*. Bappco Publishers, Bangalore.
3. Mahindra S.N., *Food additives – Characteristics detection and estimation*. Tata Mc Graw Hill Publication Company, New Delhi.
4. Srivastav, R.P. and Sanjeev Kumar, *Fruit and Vegetable Preservation, Principles and Practice*. International Book Distribution Company, New Delhi.
- 5.. Food Facts & Principles by Shakunthala manay & Shadakhraswamy.
6. Food Science by Srilakshmi second edition,2002.
7. Potter, N. Food Science, The AVI Publishing Co., Inc., West Port, Connecticut, 1975.
8. Sunetra Roday, Food Science and Nutrition , 2nd edn. Oxford Hitech printers.

**CBCS/SEMESTER SYSTEM- III SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-3 Paper-2 Lab: Food additives (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Estimation of NaCl in processed foods.
2. Estimation of sulfated ash.
3. Estimation of SO₂.
4. Estimation of Benzoate.
5. Estimation of Pectin from Fruits and Vegetables.
6. Determination of Lycopene content in foods.
7. Estimation of Chlorophyll content.
8. Estimation of Carotenoids.
9. Estimation of total soluble solids using refractometer.
10. Effect of NaCl in food preservation

**CBCS/Semester System (2020-21) – III Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-3 Paper-3: PROCESSING AND PRESERVATION OF FOODS-1 (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable students

1. To enable students to learn different methods of processing of plant and animal derived foods.
2. To understand the principles of food preservation and acquire skills in methods of food preservation

Unit- I (12 Hours)

Classification of different foods of plant origin: Cereals, Millets, Composition & constituents- Post harvest handling, Storage, methods of infestation.

Unit-II (12 Hours)

Processing of serials, pulses, fats, oil seeds.:

Processing and product development with maize, sorghum and ragi. Processing of Pulses along with different pre-treatments. Oil expelling methods with emphasis on Sesame, Sunflower, Mustard, Palm, Coconut, groundnut and Rice bran oils. Refining, Hydrogenation and Shortenings.

Unit-III (12 Hours)

Fruits and Vegetables:- Different processing operations – Fruit Juices, Squashes, Cordial, Jam, Jelly, Marmalade, Chutneys, Sauces, Pickle Processing along with Principles and methods of preparation and their usage in different communities.

Unit-IV (12 Hours)

Classification and composition of Spices and Plantation crops.: Study of special attributes of main spices like Pepper, Cardamom, Ginger, Garlic, Turmeric, Nutmeg, Coriander and Cinnamon. Chillies, Cocoa, Coffee, Tea and Gum and their processing and preservation methods.\

Unit – V (12 Hours)

Classification of animal foods: Meat and Meat products selection, Meat and Meat Products, Egg & Avian Products, Milk & milk products, Fish & Fishery products, and their composition. Characters of animal foods and selection of different animals foods for processing.

Books for Reference:

1. J.L. Multon, A.M. Riembert, D. Marsb & A.J. Eydt 1st edition, *Preservation & Storage of Grain, Seeds and their Products*, CBS Publications and Distributors, Delhi.
2. Kent, *Cereal Technology*, Oxford Perman Press, London.
3. Giridharlal, Sidappa and G.L. Tandon, *Preservation of Fruits and Vegetables*, ICAR, New Delhi.
4. Dey.S, *Outlines of Dairy Technology*, Oxford University Press, New Delhi, 1994.
5. Lawrie R.A, *Meat Science*, Paragon Press Oxford, New York.
6. Borgstorm G. *Fish as Food*, Vol-4, New York Academic Press.

CBCS/Semester System (2020-21) – III Semester Syllabus
B.Sc. FOOD TECHNOLOGY

DSC-3 Paper-3: PROCESSING AND PRESERVATION OF FOODS-1
(PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Determination of quality parameters of rice and wheat.
 2. Processing of flaked, parboiled and puffed rice.
 3. Experiments on flour quality.
 4. Flow properties of different raw materials (flours and grains)
 5. Processing of different wheat products.
 6. Planning and preparation of malted products.
 7. Processing and preservation of different fruit and vegetable based products (jams, jelly, marmalade, pickles, squashes, juices and cordials).
 8. Visit to rice and wheat/millet processing industry and study of different equipment.
 9. Visit to fruits, vegetables & spice processing industry and study of processing.
-
1. Methods of Food Preservation using salt and sugar.
 2. Drying and Dehydration
 3. Food Adulteration tests for some common foods.
 4. Preservation and bottling of fruit and vegetable products.
 5. Preservation by using chemicals
 6. Sensory analysis of preserved and processed foods.

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER –IV

S. No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	DSC-4, Paper-1 (CORE) Food Process Engineering-2 (THEORY)	100	25	75	4	4
2	DSC-4, Paper-1 Lab: Food Process Engineering-2 (PRACTICAL)	50	0	50	2	1
3	DSC-4, Paper – 2 (CORE) Food Analysis (THEORY)	100	25	75	4	4
4	DSC-2, Paper –2 Lab: Food Analysis (PRACTICAL)	50	0	50	2	1
5	DSC-4, Paper-3 (CORE) Processing and Preservation of Foods-2 (THEORY)	100	25	50	4	4
6	DSC-4, Paper-3 Lab: Processing and Preservation of Foods-2 (PRACTICAL)	50	0	50	2	1
7	DSC-4, Paper 4 (CORE) Food Safety and Quality control (THEORY)	100	25	75	4	4
8	DSC-4, Paper-4 Lab: Food Safety and Quality control (PRACTICAL)	50	0	50	2	1
9	DSC-3 Paper-5 (CORE) Food Trade and Business Management (THEORY)	100	25	75	4	4
10	DSC-4, Paper-5 Lab: Food Trade and Business Management (PRACTICAL)	50	0	50	2	1
11	DSC-4 Paper-6 (CORE) Food Packaging	100	25	75	4	4
12	DSC-4, Paper-6 Lab: Food Packaging (PRACTICAL)	50	0	50	2	1
13	Extension activities	-	-	-	-	2
13	Yoga	-	-	-	-	1
	Total	900	150	750	36	33

**CBCS/Semester System (2020-21) – IV Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-4 Paper-1: FOOD PROCESS ENGINEERING-2 (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

To study about fluids, how to process the food

To understand about heat transfer, and how many types of processing

To study state of heat transfer, and technology behind harvesting

To solve problems involved in dilution, concentration & dehydration. To study about the milling & processing of pulses & oils.

To know different types of equipment used in food processing industries.

UNIT-I (12 Hours)

Distillation- types- Vacuum, Batch, Stage and Steam distillation and their applications.

Mixing- definition, Mixing of solids, liquids and pastes, Mixing equipment- Double cone mixer, Ribbon, Kneader, Propeller mixer.

Forming- Bread, Pie, Biscuit and Confectionary molders.

UNIT-II (12 Hours)

Crystallization- Introduction, applications and basic principles involved. Agitation-Blending, Pulverization and Leaching equipment, Hygienic design of food processing equipment, hygienic design principles and properties, Sanitary equipment, Sanitary pipes and fittings, Food processing equipment and its applications in food processing industries.

UNIT-III (12 Hours)

Mechanical separation- Filtration, filtration equipment, Sedimentation, Centrifugal and liquid-liquid separation, Centrifuge and its applications, Grinding and Cutting, Energy used in grinding, Kick's Law, Rittinger's Law and Bond's Law, Particle size distribution, Crushing efficiency, Contact equilibrium separation process.

Concentration- gas-liquid equilibria, solid-liquid equilibria, Extraction – stage equilibrium extraction.

UNIT-IV (12 Hours)

Clarifiers, Desludging and decanting machines, Expression- Batch and Continuous type, Sterilization– principles and equipment, Processing in containers, Process time, T- Evaluation, Design of batch and continuous sterilizers. Extraction- Extraction equipment, supercritical fluid extraction, heat and mass recovery and vacuum evaporating devices.

UNIT-V (12 Hours)

Baking- principles of baking, different types of ovens, Roasting and Frying equipment, different types of roasters and fryers, Extrusion Cooking.

Freezing- types of freezers ,including icecream freezers , Permeability- theoretical considerations, permeability of gases and vapors, permeability of multilayer material, permeability in relation to packaging requirements in food.

**CBCS/Semester System (2020-21) – IV Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-4 Paper-1: FOOD PROCESS ENGINEERING-2 (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

- 1) Determination of thermal death time.
- 2) Experiments on tray dryer.
- 3) Experiments on osmotic drying.
- 4) Experiments on extrusion cooking.
- 5) Determination of bulk density and angle of repose of grains and flours
- 6) Study of CIP treatment in dairy plant.
- 7) Visit to food processing industry to observe various process operations and equipment used

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC- 4 Paper-2: Food Analysis (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

- To get knowledge of various macro and micro nutrients in foods
- To learn various techniques used to analyze the food components
- To know about various instruments used in estimating bio molecules
- And principles involved.

UNIT-I (12 Hours)

Principles and methods of estimation of moisture, Ash and Minerals.

UNIT-II (12 Hours)

Carbohydrates- Methods of estimation of carbohydrates, qualitative and quantitative methods, advantages and disadvantages
Crude fibre and fibre fractions- methods of determining fibre fractions, soluble and insoluble fibre estimation.

UNIT-III (12 Hours)

Total Proteins- Qualitative and quantitative methods, principles and methods of determination of Protein nitrogen and non-protein nitrogen. advantages and disadvantages:

UNIT IV (12 Hours)

Principles of estimation of Vitamins.
Total fat- methods and principles of estimation of fats.

UNIT V (12 Hours)

Food analysis Instrumentation- Principles and application of colorimetry, spectroscopy, and chromatography.

Reference Books:

1. Food Chemistry Seemayadav, Author publication of Anmol Pvt. Ltd., 437/4B Ansari Road, Daryaganj, New Delhi, 1997.
2. Owen R. Fennema, Food chemistry 2nd edition Revised & Expanded.
3. A First Course In food Analysis by Ay Sathe 1999
4. Food Analysis, Theory & Practice by Yeshajahu P, Clifton E & Meloan

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC -2 Paper-2 LAB: FOOD ANALYSIS(PRACTICAL)

**Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks**

**Credits: 1
Sem. end exam: 50 Marks**

1. Determination of Gluten content in wheat.
2. Estimation of Acidity in wheat flour.
3. Estimation of Fiber content in any one food.
4. Determination of acid number of oils.
5. Determination of iodine number of oils.
6. Estimation of ash content in any one food.
7. Determination of Calcium content in milk.
8. Estimation of Iron content in any one food.
9. Estimation of Phosphorous content in any one food.
10. Demonstration of Protein content in foods.
11. Estimation of Ascorbic Acid content in Citrus fruit juice.

**CBCS/Semester System (2020-21) – IV Semester Syllabus
B.Sc. FOOD TECHNOLOGY**

DSC-4 Paper-3: PROCESSING AND PRESERVATION OF FOODS-2 (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable students

1. To enable students to learn different methods of processing of plant and animal derived foods.
2. To understand the principles of food preservation and acquire skills in methods of food preservation
3. Various preservation and methods of post harvest techniques used for animal foods.

Unit-I (12 Hours)

Methods of slaughter – humane & religious methods. Different cuts of meat structure & composition of meat. Different methods of processing & preservation of meat & meat products. Egg & Avian Products. Structure & Composition of eggs from different sources.

Unit-II (12 Hours)

Grading, packaging and preservation of eggs. Processing of different products such as frozen & dried products. Chemical composition of Avian meat. Different methods of preservation.

Unit-III (12 Hours)

Milk & Milk products. Composition of milk from different species. Physicochemical properties. Milk & milk products. Processing & preservation of milk & milk products. Fermented milk products and indigenous milk products processing & preservation.

Unit-IV (12 Hours)

Fish and marine products: Types and their Classification and Nutritive value of fish, prawn and other marine products. Selection, grading, processing of different fish & fishery products.

Unit-V: (12 Hours)

Special emphasis on salting & other novel methods of preservation of fish and fishery products, Shelf life and quality of processed products. Usage of these products in different areas and communities.

Books for Reference:

- A. J.L. Multon, A.M. Riembert, D. Marsb & A.J. Eydt 1st edition, *Preservation & Storage of Grain, Seeds and their Products*, CBS Publications and Distributors, Delhi.
- B. Kent, *Cereal Technology*, Oxford Perman Press, London.
- C. Giridharlal, Sidappa and G.L. Tandon, *Preservation of Fruits and Vegetables*, ICAR, New Delhi.
- D. Dey.S, *Outlines of Dairy Technology*, Oxford University Press, New Delhi, 1994.
- E. Lawrie R.A, *Meat Science*, Paragon Press Oxford, New York.
Borgstorm G. *Fish as Food*, Vol-4, New York Academic Press.

**CBCS/SEMESTER SYSTEM- IV SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-4 Paper-3 LAB: PROCESSING AND PRESERVATION OF FOODS-2 (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Study of different slaughtering methods.
2. Study of different dressing methods.
3. Preservation techniques of meat products.
4. Preservation techniques of egg products.
5. Preservation of various chicken products.
6. Sampling, analysis and processing of milk.
7. Processing of various milk products.
8. Selection & grading of fishery products.
9. Preservation of different fish & fishery products.
10. Visit to Dairy and fish and meat processing industries to observe different processes adapted.

**CBCS/Semester System (2020-21)-IV Semester Syllabus
B.Sc. FOOD SCIENCE AND NUTRITION**

DSC-4, Paper-4: FOOD SAFETY AND QUALITY CONTROL (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

1. To gain knowledge about food laws and standards for food quality
2. To know about food additives and quality control of foods.

UNIT-I (12 Hours)

Principles of Quality control of foods –Raw material control, processed food control and finished product inspection. Leavening agents- classification, uses and optimum levels. Food additives - Preservatives, colouring, flavouring, sequestering agents, emulsifiers, antioxidants.

UNIT-II (12 Hours)

Standardisation systems for quality control of foods:-National and International standardization system, GMP, GHP. Different types of food grade materials. Food adulteration - Common adulterants in foods and tests to detect common adulterants.

UNIT-III (12 Hours)

Standards for foods: Cereals and pulses, milk and milk products, Coffee, tea, sugar and sugar products.

UNIT-IV (12 Hours)

Methods for determining quality - Subjective and objective methods. Sensory assessment of food quality-appearance, color, flavour, texture and taste, different methods of sensory analysis, preparation of score card, panel criteria, sensory evaluation room.

UNIT-V (12 Hours)

Food safety, Risks and hazards: Food related hazards, Microbial consideration in food safety, HACCP-principles and structured approach. FSSAI

Reference Books:

1. Food science-Norman potter
2. Food Technology-Presscott.S.C.and Procter

3. Food chemistry-Meyer
4. Food science, Chemistry and experimental foods-M.Swaminathan
5. Food chemistry-Lee
6. Food science-Srilakshmi(2001)2nd edition, New age international publishers-(2001)
7. Rerfus.K.Guthrie-Food sanitation –3rd edition –Van Nostrand Reinhold Newyork 1988.
8. Mahirdra-S.N.-Food safety –A techno-legal analysis-Tata McGrawhill publishers 2000.
9. Manoranjan Kalia-Food processing and preservation.
10. Roday-Food hygiene and sanitation.
11. Indian Food industry,2000,Vol19:2

CBCS/SEMESTER SYSTEM (2020-21) - IV SEMESTER
B. Sc FOOD SCIENCE AND NUTRITION

DSC-4, Paper-4 LAB: FOOD SAFETY AND QUALITY CONTROL (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Market survey of preserved fruits and vegetable products.
2. Visit to food testing lab or any agency of food standards.
3. Nutrition labeling requirements and developments.
4. Simple tests for food adulteration.
5. Case study on food safety issues – ICDS/MDM, Diarrheal outbreak / any other.

**CBCS/SEMESTER SYSTEM- IV SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC- 4 Paper-5: Food Trade and Business Management (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

To gain knowledge of food trade business and various aspects of food trade business.

Knowledge of various national and International export agencies and rules.

To design plant lay out to set up a food processing industry.

To acquaint with various licensing aspects of food trade.

Unit-I (12 Hours)

Business Principles, Practices and Policies of Food trade. Mechanism of foreign exchange, WTO, GATT, International Trade in Agriculture, world consumption of food. Marketing strategies, Licensing Registration, Business ethics and income Lab, Labor laws

Unit-II (12 Hours)

Pattern and types of food consumption, APEDA, MOFPI, Spices Board, BIS etc, Food Marketing classification, Consumer behavior, demand and forecasting demand and marketing pigmentation. Export Import Policies, Functions of Management, Forecasting and slips in forecasting.

Unit-III (12 Hours)

Product planning and linear programming, Market Segmentation, Process of Marketing, Market Positioning, Penetration and Target Marketing, Scope and importance of personal marketing, Product Life Cycle, Sales promotion, break even analysis, Programme Evaluation and Review Technique. Social aspects of food marketing, Advertisings, features, objectives, effectiveness and components of advertisement.

Unit-IV (12 Hours)

Food plant layout & Process planning for the product, Scale of operations of food industry in India. Factors determining fixed capital requirements. Establishing the food product unit. Creativity and innovation problem solving. personnel management, salaries, wages and incentives, performance appraisal, quality control.

Unit-V : (12 Hours)

Laws governing of food products, Role of consumers and role of food business people, formulation and selling of products. Food Marketing and Sales management. Trade – Distinction between Home trade and International trade. Sources and factors of fixed capital and working capital.

Books for Reference:

1. D. David and S. Ericson, *Principles of Agri. Business Management*. Tata Mc Graw Hill Book Co., New Delhi.
2. P.K. Srivastava, *Marketing Management*. Himalaya Publishing House, New Delhi.
3. G.S. Batra and Narinder Kumar, *GATT implications of Denkel proposal*. Azmol Publications, New Delhi.

**CBCS/SEMESTER SYSTEM- IV SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC- 4 Paper-5-Lab: Food Trade and Business Management (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Enlistment of RTE and RTC foods available in local shopping malls and their movement.
2. Observation of various OTC products and identification of highly perishable and fast moving in various outlets in your locality.
3. Export quality management in food industry.
4. Project feasibility report and cost benefit analysis for baking industry.
5. Industrial visit to different Food Processing industries.

**CBCS/SEMESTER SYSTEM- IV SEMESTER
B.Sc. FOOD TECHNOLOGY**

DSC-4 Paper-6: FOOD PACKAGING (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

- To impart comprehensive overview of the scientific and technical aspects of food packaging.
- To study about food packing materials.
- To know the evaluation of packing material & packing performance.
- To instill knowledge on packaging machinery, systems, testing and regulations of packaging.
- To gain knowledge on food packaging and applications during transportation.
- To understand about recent trends in packing

Unit-I (12 Hours)

Packaging Science, Definition, History, Types of Materials - Uses, Application, Advantages and Disadvantages of each - Status of Packaging industry in India, Economics, Environmental hazards, Waste management and Consumer awareness.

Unit – II (12 Hours)

Need of Packaging food - Logistics - Merchandising Outlets - Handling - Transportation - Packaging machinery - Technology upgradation - Public distribution

-Cost effective packaging - Packaging requirements - Levels of Packaging - Packaging functions - Attractiveness - Protection - Convenience - Printability – Differentiability.

Unit-III (12 Hours)

Labeling Laws - Packaging laws and Regulations - SWMA Rules - PFA Rules - FPO

Rule MFPO Rules - Agmark Rules - Class ‘A’ commodities - Class ‘B’ commodities -

Misbranded Labeling rules for infant foods.

Unit-IV (12 Hours)

Classification of Packages, Primary, Secondary and Tertiary – Special Box / Carton, Shrink, Aerosol, Vacuum, Boil-in-bag, Tetra pack, Squeeze tubes, etc. Significance and functions - Construction of Packages, Process Chart - Shelf life testing.

Unit-V (12 Hours)

Machinability - Environmental Impact - Low cost containment - Communication – Resealing features - Non toxicity - Aroma retention Hazards acting on Package during transportation - Moisture impact - Light impact – Common insect pests - Changes in food quality - Biological changes in food quality

Books for Reference:

1. Gordon I Robertson, *Food Packaging Principles and Practice*, CRC Press, London.
2. Ranganna S, *Handbook of Analysis and Quality Control, Fruits and Vegetables Products*, Tata Mc Graw Hill, New Delhi, 1986.

**CBCS/SEMESTER SYSTEM- IV SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-4 Paper -6 Lab: Food packaging (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

Objectives: To enable the student

1. Observation of different packaging materials used for different foods and evaluation of sensory parameters and shelf life.
2. Measurement of thickness of paper and paper boards.
3. Measurement of basic weight of paper and paper boards.
4. Measurement of bursting strength of paper and paper boards.
5. Measurement of resistance of packaging materials
6. Visit to a food Industry and observing different packaging machines and methods.
7. Visit to Dairy Industry.

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER – V

S. No	Course	Total Marks	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	DSC-5, Paper-1 (SEC-1) Fermentation Technology (Theory)	100	25	75	4	4
2	DSC-5 Paper-1 Lab: Fermentation Technology (PRACTICAL)	50	0	50	2	1
3	DSC-5, Paper-2: (SEC-2) Product development and evaluation (THEORY)	100	25	75	4	4
4	DSC-5, Paper-2 Lab: Product development and evaluation (PRACTICAL)	50	0	50	2	1
5	DSC-5, Paper-3 (SEC-3) Dairy Technology (THEORY)	100	25	75	4	4
6	DSC-5, Paper-3 Lab: Dairy Technology (PRACTICAL)	50	0	50	2	1
7	DSC-5, Paper 4 (SEC-4) Post Harvest Technology (THEORY)	100	25	75	4	4
8	DSC-5, Paper-4 Lab: Post Harvest Technology (PRACTICAL)	50	0	50	2	1
9	DSC-5, Paper-5 (SEC-5) Food Quality and Certification (THEORY)	100	25	75	4	4
10	DSC-5, Paper-5 Lab: Food Quality and Certification (PRACTICAL)	50	0	50	2	1
11	DSC-5, Paper-6 (SEC-6) Baking and confectionery Technology (THEORY)	100	25	75	4	4
12	DSC-5, Paper-6 Lab: Bakery and confectionery Technology (PRACTICAL)	50	0	50	2	1
13	NCC/NSS/SPORTS/EXTRA CURRICULAR	-	-	-	-	2
14	YOGA	-	-	-	-	1
	Total	900	150	750	36	30

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-5, Paper-1: FERMENTATION TECHNOLOGY (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: Enable the students

1. To understand the principles of food fermentations
2. To study the production of various fermented foods.
3. To gain knowledge about different downstream methods.

Unit-I (12 Hours)

Introduction to Industrial Fermentations: Screening, isolation and maintenance of industrially important microorganisms. Types of fermentation processes and Range of products, Fermentor, Fermentation media, carbon and nitrogen sources, Application of non- conventional raw materials. Isolation and purification of microbial metabolites.

Unit-II (12 Hours)

Production of microbial metabolites: Production of organic acids: citric acid, Acetic acid and lactic acid. Production of amino acids: L-glutamic acid and L-aspartic Acid.

Unit-III (12 Hours)

Production of microbial metabolites: Production of antibiotics: penicillin and tetracycline. Production of industrial enzymes: Pectinases, Amylases and Proteases.

Unit-IV (12 Hours)

Food fermentations: Fermented milk foods: Cheese and Butter. Fermented vegetable foods- Sauerkraut, fermented pickles and soya sauce and Tofu. Single cell protein- Production of Baker's yeast and Commercial Production of bread.

Unit-V (12 Hours)

Production of industrial pigments: Commercial production of red and violet bacterial pigments. Mushroom culture- Button (*Agaricus*) and Oyster (*Pleurotus*) mushrooms. Production of fermented beverages – beer and wine.

Text Book(s)

1. A. H. Patel, *Industrial Microbiology*, 2/e, MacMillan Publishers, 2012.
2. N. Okafor, *Modern Industrial Microbiology and Biotechnology*, Science Publishers, 2007.
- Casida, L E JR., *Industrial Microbiology*, New Age International Publishers, 1968.

References

1. E. M. T. El Mansi, C. F. A. Bryce, A. L. Demain, A. R. Allaman, *Fermentation Microbiology and Biotechnology*, 3/e, Taylor and Francis, 2011.
2. W. C. Frazier, D. C. Westhoff and N. M. Vanitha, *Food Microbiology*, 4/e, McGraw Hill, 2014.
3. A. N. Glazer and H. Nikaido, *Microbial Biotechnology: Fundamentals of Applied Microbiology*, 2/e, Cambridge University Press, 2007.
4. G. Reed, *Presscott and Dunn's Industrial Microbiology*, 4/e, CBS Publishers and Distributors, 2004.
5. W. Cruger and A. Cruger, *Biotechnology: A Textbook of Industrial Microbiology*, Panima Publishing Corporation, 2003

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER
B. Sc., FOOD TECHNOLOGY**

DSC-5, Paper-1, Lab: FERMENTATION TECHNOLOGY(PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Isolation and characterization of industrial cultures.
2. Analysis of raw materials.
3. Fermented beverages – Production and analysis of wine and beer
4. Production of fermented pickles.
5. Production of Citric acid
6. Baker's yeast production.
7. Preparation of whey based fermented beverages.
8. Production and analysis of Vinegar

Text Books:

1. Fermentation, A Practical approach IRL.

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-2: Paper-2: FOOD PRODUCT DEVELOPMENT AND EVALUATION (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: Enable the students
To understand the latest consumer demand for novel food products.
Learn and develop novel technology to develop new products.
Cost analysis and feasibility of new product development.
Thorough knowledge of sensory and shelf life evaluations foods.

UNIT – I (12 Hours)

Food needs and consumer preferences, Need for new products, Innovations in product development, need, classification, characterization, Needs and types of foods consumption trends. Economic, psychological, anthropological and sociological dimensions of food consumption. Factors to be considered new product development – social concerns, health concerns, impact of technology, market influence, market sector perspective and market research. Consumer research and the market. Trends in social change and its role in diet pattern, Identifying the need for new products. Designing need based new products and the R & D Process.

UNIT – II (12 Hours)

Phases of food product development- introductory phase, growth phase, maturity phase and decline phase. Developing standard products, Types of products and logistics. Processing- primary and secondary, various food ingredients used, use of food additives. Standardization and large scale preparation Safety and regulatory aspects, sanitation and waste disposal

UNIT – III (12 Hours)

Packaging - Development of suitable packaging material, management. Design and package graphics. Labelling, and testing.

Storage and transportation-Types and mode of transportation, optimization of transport taking into account the type of product, distance, storage facilities.

UNIT – IV (12 Hours)

Product costing, Advertising and marketing, Entrepreneurship, plant location, Investment and financing of project.

UNIT-V (12 Hours)

Chemical and physical properties of foods, Shelf life studies and shelf life prediction. Planning for the food product to be developed, Processing steps, ingredients required, equipment required, standardization, evaluation, large scale production, packaging and shelf life studies. Drawing up a working plan and time schedule.

References:

1. Snack Food Technology (1993) by S.A. Matz.
2. Principles of Cereal Science and Technology (1986) by R.C. Horseny.
3. Food Science (1998) by N. N. Potter *et al.*
4. Breakfast Cereals and How They are Made? (1990) by R.B. Fast and E.F.Caldwell. Food Science (5th edition) by N. N Potter et al.
5. Snack Food Technology (3rd edition) by S.A. Matz.
6. Text book of Food science and Technology (2001) by VijayaKhader.
7. Storage of cereal grains and their product (3rdedition) by C.M. Christenson.
8. Technology of Cereals (4th edition) by Kents.

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

**DSC-5, Paper-2 Lab: Food Product Development and Evaluation
(PRACTICAL)**

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Market survey and enlisting various RTE food products available in the market and their movement..
2. Visit to a community nutrition programme in nearby area.3.
3. Selection of a target group and development of a food product to fulfill the nutritional needs of the target group.
4. Development of low cost products by using byproducts of oil industry.
5. Tests to determine nutritional parameters
6. Tests to determine sensory parameters
7. Determination of Packaging the food product and labeling
8. Estimating cost and market price, storage and transportation considerations
9. Standardization and evaluation for large scale production of the product

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-5, Paper 3-: DAIRY TECHNOLOGY (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: Enable the students

1. To know the need and importance of dairy industry
2. To know the compositional and technological aspects of milk and Processed milk products.
3. To develop young entrepreneurs for self-employment through dairy technology and associated activities.
4. To know the utilization of byproducts of dairy industry

UNIT 1 (12 Hours)

Dairy development, milk production – Dairy development in India and its importance. Systems of collection of milk- Reception, Platform testing. **Properties of milk:** Physicochemical properties of milk- Color, taste, pH and buffering capacity, refractive index, viscosity, surface tension, freezing, boiling point, specific heat. Milk Composition, its Constituents and Nutritional Importance
Preservatives, Neutralizers and Adulterants in Milk and their Detection.

UNIT-2 (12 Hours)

Equipment and Cold storage:

Equipment used in dairy industry-Equipment for Fluid Milk Processing, Equipment for Milk Products Processing. Cleaning and maintenance of equipment. Refrigeration System-Basic Principles and Components of Refrigeration System. Different Cooling Systems for Milk and Milk Products.

UNIT-3 (12 Hours)

Processing of milk: Thermal Processing of Milk , Various stages of processing- Clarification, separation, bactofugation, homogenization, Pasteurization and Ultra-high-temperature Processing. Packaging- materials process and machinery. Different types of fluid milk produced commercially. Storage and Distribution. Systems

UNIT-4 : (12 Hours)

Processing of milk products:

Composition, Standards, Manufacturing - Flow diagram of the following milk products, - Butter, ghee, flavored milk, yoghurt, dahi, shrikhand, ice-cream, channa, paneer, cheese. Defects during Manufacturing and Storage of- Curd/Dahi, Yoghurt, Shrikhand, Cheese (cheddar). Quality control and sensory evaluation of the products.

UNIT-5 (12 Hours)

Dairy By products:

Skim Milk – Casein and Caseinates. Whey – Whey Beverages, Whey Powder, Whey Protein Concentrates, Lactose, Ghee Residue. New Technologies in By-product Utilization (Membrane Processing – Reverse Osmosis and Ultra Filtration)

Recommended Readings

1. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford, 2007.
2. Webb and Johnson, Fundamentals of Dairy Chemistry, 3rd ed., CBS Publishers, New Delhi 1988.
3. Eram S. Rao. Food Science Experiments and Applications. CBS Publishers. 2nd Edition, 2011.
4. Frazier WC and Westhoff DC. Food Microbiology. Tata McGraw-Hill Publishing Company Limited, 1995.
5. Knechtges LI. Food Safety-Theory and Practice, USA: Jones and Barlette Learning 2012.
6. The Food Safety and Standards Act along with Rules and Regulations. Delhi: Commercial Law Publishers (India) Pvt Ltd, 2011.

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER
B.Sc., FOOD TECHNOLOGY**

DSC-5, Paper-3 Lab: DAIRY TECHNOLOGY (PRACTICALS)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Performing the platform tests of milk.(Acidity,COB,MBRT,specific gravity,SNF).
2. Estimation of milk protein by Folin method.
3. Estimation of milk fat by Gerber method.
4. Preparation of curd and Yoghurt.
5. Preparation of Shrikhand.
6. Preparation of Cheddar Cheese.
7. Preparation of Processed Cheese.
8. Preparation of Ice Cream and Determination of Overrun.
9. Visit to Ice-Cream Factory Experiment

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-5, Paper-4: POST HARVEST TECHNOLOGY (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: To enable the students

1. Knowledge about food spoilage agents and prevention.
2. Understand the safety control measures in handling foods from harvest to consumption agencies of control.

UNIT I (12 Hours)

Introduction to Post Harvest Technology - Definition, importance and Governmental measures to augment food production- need for food conservation.

Role of Post Harvest Technology in combating malnutrition in India.

UNIT II (12 Hours)

Agents Causing Food Losses - Physical agents, (moisture, temperature), Chemical losses, biological losses- insects

UNIT III (12 Hours)

Control of Spoilage Agents - Importance and methods of sanitary handling,

UNIT IV (12 Hours)

Physical methods and chemical methods including fumigation techniques.

UNIT V (12 Hours)

Storage of Grains - Importance of storage structures- requirements, traditional & modern and underground & above ground storage and their improvements, FCI godowns. PDS.

Agencies Controlling Food Losses - Role of SGC, FCI, CWC, SWC, IGSI in controlling food losses.

Reference Books:

1. Handling and storage of food grains- S V Pingale ICAR, New Delhi, 1976.
2. Handling and storage of food grains in tropical and subtropical areas- D W Hall, FAD, Rome, 1970.
3. Food Science, N.W.Potter- The A VI Publishing Co., The Westport, 1973.
4. Food Technology, Prescott and Proctor.B.B.Mc Graw Hill Book Co., New York, 1937.
5. Gordon G Birth, Food science, Pub in New York.
6. Robins M Philip Convenience food- Recent Technology 1976.
7. Technology of cereals by NL Kent and JAD Evers.
8. Food protection technology by Charles W., Felix Havis Pub.1987.

CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER
B. Sc FOOD TECHNOLOGY

DSC-5, Paper-4 Lab:POST HARVEST TECHNOLOGY (PRACTICAL)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Processing of Selected Food Items – wheat, rice, breakfast cereals, pulses and oilseeds.
2. Related Experiences
3. Isolation of microbial contaminants from different foods, vegetables and fruits.
4. Visit to FCI (Food Processing Industries)
5. Visit to Processing Mill (Cereal & Pulse)
6. Preparation of Reports.

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-5, Paper-5:Food Quality and Certification (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)

Credits: 4

Mid Sem. Exam: 25 Marks

Sem. end exam: 75 Marks

Objectives: To enable the student

To understand the quality parameters of the foods and its importance

Learn various techniques to assess the food quality

Know about the government legislations regarding quality.

Identify adulteration in food

To know Various agencies that regulate food quality and quality standards.

Unit-I (12 Hours)

Comparison of laboratory panels with consumer panels. Limitations of survey.

Fundamentals of food regulations – Additives, Contaminants, consumer Food

regulations pertaining to aspects of hygiene, Novel foods and aspects of labeling,

Unit-II (12 Hours)

Different existing food legislations-norms in implementation. Food grade and standards - International food regulations and certifications - Indian food regulations and certifications. Major differences between Indian and International standards.

Unit-III (12 Hours)

Food laws and standards (BIS) - IPR patents - HACCP- Principles of HACCP and it's role in Food Industry - The Concept and process of implementation of HACCP in food industry

Unit-IV (12 Hours)

Concept of Codex Alimentations - USFDA - the cause of it's existence - it's role in safe guarding food quality - ISO 9000 series - significance.

Unit-V (12 Hours)

Food adulteration and safety - Fundamentals of Food regulations pertaining to Additives and Contaminants - Different existing Food legislations-norms in implementation.

Books for Reference:

1. Imteaz Ali, *Food Quality Assurance, Principles and Practices*, CHIPS, Texas.
2. J.L.Multon, *Quality Control for Food and Agricultural Products*, CHIPS, Texas.
3. Amerine, M.A.Pangborn, R.M and Rosseler, *Principles of Sensory Evaluation of Food*, Academic Press, New York, 1965.
4. Birk, G.G.Berman, J.G and Parker, K.J, *Sensory Properties of Foods, Applied Science*, London, 1977.
5. Pattee, H.E, *Evaluation of Quality of Fruits and Vegetables*, AVI, Westport. 1985.
6. Ranganna S, *Handbook of Analysis and Quality Control-Fruits and Vegetables Products*, Tata Mc Graw Hill, New Delhi, 1986.
7. BIS Standards on Sensory Evaluation.

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-5, Paper-5: Food Quality and Certification (Practical)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

1. Quality assessment of fruits, vegetables, cereals, dairy products, meat, poultry, milk and other processed products.
1. Selection and training of sensory panel.
2. Hedonic rating of food.
3. Identification and ranking of food products attributes.
4. Sensory and Instrumental methods for measuring food attribute.
5. Testing of different foods for adulterants.
6. Determination of threshold value for basic tastes and odours.
7. Judging and grading of canned food products.
8. Visit to a certification agency.
9. Visit to fruits and vegetables market for quality assessment.

**CBCS/SEMESTER SYSTEM- V SEMESTER
B. Sc FOOD TECHNOLOGY**

DSC-5, Paper- 6: BAKING AND CONFECTIONERY TECHNOLOGY (THEORY)

Teaching Hours: 4 Hours / Week (Total – 60 Hours)
Mid Sem. Exam: 25 Marks

Credits: 4
Sem. end exam: 75 Marks

Objectives: Enable the students

1. To understand the science and technology of baking
2. To the role of different ingredients in baking
3. To develop skills in planning and maintenance of a baking institution.
4. To gain knowledge about the bread, formulation & ingredients.
5. To learn the preparation of frozen dough products & application of starches in bakery industry.

UNIT I (12 Hours)

Baking - Definition, Principles of baking, classification of baked foods. Types of equipments in baking industry, cleaning and sanitizing methods of baking equipments, baking temperature of different products, operation techniques of different baking equipments.

UNIT II (12 Hours)

Ingredients and Their Role in Baking - Flour, Yeast, sugar, egg, butter, salt, baking powder, colouring, flavouring agents. List of standard colouring and flavouring agents.

UNIT III (12 Hours)

Preparation of baked foods - Quick breads, cakes and its varieties, different types of biscuits, cookies and pastries. Decoration of baked foods - Icing- Types of Icing used in different bakery product. Role of other ingredients used in icing.

UNIT IV (12 Hours)

Types of packaging materials used for bakery products, method of packaging. Quality control- Quality control of raw material / finished products. Spoilage of bread – Causes, Ropes and mold spoilage and prevention.

UNIT V (12 Hours)

Baking unit/ plant layout & design of a baking unit sanitation and hygiene.

Reference Books:

1. Potter, N. Food Science, The AVI Publishing Co., Inc., West Port, Connecticut, 1975.
2. Modern Pastry Chab, Vol.I and II, A VI Publishing Co., Inc., West Port, Connecticut, 1977.
3. Dubey, S.C. (2007). Basic Baking 5th Ed. Chanakya Mudrak Pvt. Ltd.
4. Manay, S. & Shadaksharaswami, M. (2004). Foods: Facts and Principles, New Age Publishers.
5. Raina et.al. (2003). Basic Food Preparation-A complete Manual. 3rd Ed. Orient Longman Pvt. Ltd.
6. Barndt R. L. (1993). Fat & Calorie – Modified Bakery Products, Springer US.
7. Samuel A. Matz (1999). Bakery Technology and Engineering, PAN-TECH International Incorporated.
8. Faridi Faubion (1997). Dough Rheology and Baked Product Texture, CBS Publications.
9. Baker's Handbook on practical Baking .Wheat Associates, USA, New Delhi.

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER
B.Sc., FOOD TECHNOLOGY**

DSC-5, Paper-6 Lab: BAKING AND CONFECTIONERY TECHNOLOGY (Practical)

Teaching Hours: 2 Hours / Week
Mid Sem. Exam: 0 Marks

Credits: 1
Sem. end exam: 50 Marks

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.
8. Visit to a baking industry and preparation of report

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.SC., FOOD TECHNOLOGY COURSE STRUCTURE

SEMESTER –VI

(Apprenticeship/ Internship/ Industrial Training)

S.No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	<u>Apprenticeship / Internship in Hospital/Industrial Training/On the job Training</u>	400	0	400	0	12
	TOTAL	400	0	400	0	12

CBCS/Semester System (2020-21) - VI Semester Syllabus

B.Sc., FOOD TECHNOLOGY

APPRENTICESHIP/INTERNSHIP/ON THE JOB TRAINING

Hours of instruction: 0

Credits: 12

Internals : 0

Sem end exam: 400

Objectives: To enable the students

1. To acquire professional skills in various fields of food industry /public health Institutions.
2. To become an entrepreneur by starting his own startup.

Every candidate shall undergo professional training for 90 days in Large scale/ Small scale food industries/Food processing units in VI Semester of the course. Internal evaluation will be carried out to assess the progress of the work during mid semester exams. At the end of the professional training the student has to submit a report for which viva will be conducted both by Internal and External Examiners. Allocation of 400 marks will be carried out as mentioned below.

Break up of marks for on the job training/apprenticeship

Details	Marks
Attendance	100
Training Cert	100
Project report	100
Viva voce on Project Report	100
Total marks	400