

B.Sc. FOOD TECHNOLOGY

Proposed Syllabus

Model –IV: Specialized Degree/Standalone Course: B.Sc. Food Technology (FT)

Course Structure

Semester	Discipline Components	Papers	Instruction/Week (Hours)			Duration of Exam	Internal Assessment	End Sem. Exam	Total Marks	Credits
			Lecture	Tutorial	Practical					
I	Major Subjects Theory	FTT-1.1 Fundamentals of Food Science & Technology	4	-	-	3	20	80	100	3
		FTT -1.2 Food Biochemistry	4	-	-	3	20	80	100	3
		FTT -1.3 Principles of Food Processing and Preservation	4	-	-	3	20	80	100	3
	Major Subjects Practical	FTP-1.1 Fundamentals of Food Science & Technology	-	-	3	3	10	40	50	2
		FTP-1.2 Food Biochemistry	-	-	3	3	10	40	50	2
		FTP-1.3 Principles of Food Processing and Preservation	-	-	3	3	10	40	50	2
	Language	Language-I	3	-	-	3	20	80	100	3
		Language-II	3	-	-	3	20	80	100	3
	Compulsory Theory-1	Constitutional Values-I	2	-	-	1.5	10	40	50	2
	TOTAL									700

II	Major Subjects Theory	FTT -2.1 Food & Nutrition	4	-	-	3	20	80	100	3
		FTT -2.2 Food Microbiology	4	-	-	3	20	80	100	3
		FTT -2.3 Fundamentals of Food Engineering	4	-	-	3	20	80	100	3
	Major Subjects Practical	FTP-2.1 Food & Nutrition	-	-	3	3	10	40	50	2
		FTP-2.2 Food Microbiology	-	-	3	3	10	40	50	2
		FTP-2.3 Fundamentals of Food Engineering	-	-	3	3	10	40	50	2
	Language	Language-I	3	-	-	3	20	80	100	3
		Language-II	3	-	-	3	20	80	100	3
	Compulsory Theory-2	Constitutional Values-II	2	-	-	1.5	10	40	50	2
	Compulsory Theory-3	Environmental studies	3			2	10	40	50	2
TOTAL									750	25
III	Major Subjects Theory	FTT -3.1 Technology of Cereals, Pulses and Oilseeds	4	-	-	3	20	80	100	3
		FTT -3.2 Dairy Technology	4	-	-	3	20	80	100	3
		FTT -3.3 Food Safety & Standards	4	-	-	3	20	80	100	3
	Major Subjects Practical	FTP -3.1 Technology of Cereals, Pulses	-	-	3	3	10	40	50	2

		and Oilseeds								
		FTP -3.2 Dairy Technology	-	-	3	3	10	40	50	2
		FTP -3.3 Food Safety & Standards	-	-	3	3	10	40	50	2
	Language	Language-I	3	-	-	3	20	80	100	3
		Language-II	3	-	-	3	20	80	100	3
	DSE -1 (Anyone)	Food Supply Chain Management	2	-	-	1.5	10	40	50	2
		Food Waste Valorization								
TOTAL									700	23
IV	Major Subjects Theory	FTT -4.1 Technology of Meat, Poultry, & Marine Foods	4	-	-	3	20	80	100	3
		FTT -4.2 Confectionery & Baking Science	4	-	-	3	20	80	100	3
		FTT -4.3 Flavour Technology	4	-	-	3	20	80	100	3
	Major Subjects Practical	FTP -4.1 Technology of Meat, Poultry, & Marine Foods	-	-	3	3	10	40	50	2
		FTP -4.2 Confectionery & Baking Science	-	-	3	3	10	40	50	2
		FTP -4.3 Flavour Technology	-	-	3	3	10	40	50	2

	Language	Language-I	3	-	-	3	20	80	100	3
		Language-II	3	-	-	3	20	80	100	3
	DSE-2 (Anyone)	Food Plant Sanitation	2	-	-	1.5	10	40	50	2
		Foodomics								
	SEC (Practical)	Industrial Manufacturing of Food and Beverages	-	-	3	3	10	40	50	2
		TOTAL								700
V	Major Subjects Theory	FTT -5.1 Technology of Fruits & Vegetables	4	-	-	3	20	80	100	3
		FTT -5.2 Fundamentals of Food Packaging	4	-	-	3	20	80	100	3
		FTT -5.3 Food Product Development & Formulation	4	-	-	3	20	80	100	3
	Major Subjects Practical	FTP -5.1 Technology of Fruits & Vegetables	-	-	3	3	10	40	50	2
		FTP -5.2 Fundamentals of Food Packaging	-	-	3	3	10	40	50	2
		FTP -5.3 Food Product Development & Formulation	-	-	3	3	10	40	50	2
	Internship	Internship	-	-	-	-	100	-	100	4

		Viva	-	-	-	-	50	-	50	2
	AEC	Scientific Writing	2	-	-	1.5	10	40	50	2
			TOTAL						700	23
VI	Major Subjects Theory	FTT -6.1 Processing of Spices & Plantation Crops	4	-	-	3	20	80	100	3
		FTT -6.2 Fundamentals of Sensory Evaluation	4	-	-	3	20	80	100	3
		FTT -6.3 Fermentation & Beverage Technology	4	-	-	3	20	80	100	3
	Major Subjects Practical	FTP -6.1 Processing of Spices & Plantation Crops	-	-	3	3	10	40	50	2
		FTP -6.2 Fundamentals of Sensory Evaluation	-	-	3	3	10	40	50	2
		FTP -6.3 Fermentation & Beverage Technology	-	-	3	3	10	40	50	2
	Project	Project Work	-	-	-	-	150	-	150	6
		Viva	-	-	-	-	50	-	50	2
				TOTAL						700
GRAND TOTAL									4200	140

SEC: Skill Enhancement Course, VAC: Value Addition Course, AEC: Ability Enhancement Course, DSE: Discipline Specific Elective

Admission Criteria:

Pass in 2nd PUC/10+2 or equivalent examination with a minimum 45% aggregate marks and Chemistry/Biology as compulsory subjects. The above subjects taken together of any Board recognized by the respective State Government /Central Government/Union Territories.

Qualifications of the Faculty:

- Master's degree in Food Technology/ Food Science and Technology/Food Science and Nutrition / Home Science (Specialization in Food and Nutrition) or a closely related field from a recognized Institution/University.
- NET/SLET/PhD in Food Technology/ Food Science and Technology/ Food Science and Nutrition / Home Science (Specialization in Food and Nutrition) or a closely related field from a recognized Institution/University shall be the minimum criteria with 10+2+3+2 pattern as per the UGC regulations for the appointment.

Exam Pattern:

Each course is evaluated for a total weightage of 100%, out of the total: 20% for Formative Assessment and 80% for Summative Assessment. This uniform approach applies to all course types including theory and practical.

The details are given in the following table:

Theory:

Formative Assessment	
Assessment Type	Weightage in Marks
Test-1	10
Assignment	5
Seminar	5
Total	20 Marks
Summative Assessment (80 Marks) + Formative Assessment (20 Marks) = 100 Marks	

Practical:

Formative Assessment	
Assessment Type	Weightage in Marks
Test-1	5
Class Performance	5
Total	10 Marks
Summative Assessment (40 Marks) + Formative Assessment (10 Marks) = 50 Marks	

Evaluation Schedule: The above assessments strictly follow the university's academic calendar to ensure structured and timely evaluation.

SEMESTER-I

FTT-1.1: Fundamentals of Food Science and Technology

Credits: 03

Contact Hours: 56 hrs

UNIT-I

16 hrs

Introduction: Importance of Food processing Industries, Historical evolution of Food processing industries, Growth and development in Indian and MNCs; Social network impact on food industries.

Grains: Cereals-Production, composition and structure, types, parboiling of rice, physiochemical changes of cereals: gelatinization, retrogradation, dextrinization, modified starch, malting and Non-enzymatic browning. Pulse- Compositions and classification. Anti-nutritional factors, soaking, decortification, cooking and fermentation. Millets- Major and minor millets, composition, structure and health benefits.

UNIT-II

12 hrs

Vegetables and Fruits: Classification of vegetables, Maturity indices of vegetables structure and its composition. Classification of fruits. Maturity indices of fruits, blanching, commercial processing of fruits. Root crops: Commercial importance of root crops and its production.

Nuts: Types, nutrition composition and its health benefits.

Oil seeds: types, importance, Fats: Source, hydrogenation of fats, rancidity- types and its impact on quality of products.

UNIT-III

12 hrs

Meat, Poultry, Egg and Fish: Composition, Structure, Health benefits, Processing, production of processed products.

Milk and Milk Products: Composition of milk, types, processing of milk and its health benefits.

Spices and Plantation Crops: Major and minor spices, production and importance, commercial importance of Tea, coffee, Cocoa, Coconut, Cashew, Arecanut, Oil Palm, Palmyrah, kokum.

UNIT-IV

16 hrs

Processed Products: Beverages-Fruit based products, Alcoholic products, Tea and coffee products, Cereals and cereals-based products, Pulses and legumes-based products, Extrusion products, Refined and cold pressed cooking oil. Ready to eat, Ready to serve, and Ready to cook products. Specialty Foods- Supplementary foods, Proprietary foods, Specific oriented consumer foods- Space/Astronaut, Defense, and Sports person.

Microbial Aspects of Foods: Beneficial bacteria and food pathogenic bacteria. Safety aspect in cooking and storage condition. Packaging- Introduction, Types of packaging and its importance.

FTP-1.1: Fundamentals of Food Science and Technology

Credits: 02

Contact Hours: 42 hrs

1. Market survey of processed foods.
2. Preparation of Ready to eat products.
3. Preparation of Ready to serve Products.
4. Perform Blanching and prevention of browning in fruits and vegetables.
5. Report on Food misbranding and Food adulteration.
6. Identification of different kinds of packaging material.
7. Performance of common a food adulteration test as per DART by FSSAI.

Reference:

1. S. Manay, N S. Swamy (2021). Food Facts and Principles. New Age International Publishers. Edition :5
2. Potter NN, Hotchkiss JH (2012). Food Science. CBS publishers and distributors. Edition: 9th
3. Murano, Peter S (2002). Understanding Food Science and Technology. Wadsworth Publishing Co Inc.
4. Rao D G (2023). Fundamentals of Food Engineering. PHI learning private limited. Edition:2nd
5. M. Shafiur Rahman (2020). Handbook of food preservation. CRC Press.Edition: 3rd
6. Geoffrey Cambell-Platt. (2017). Food Science and Technology. Wiley Blackwell. Edition:2nd
7. Henning Hansen (2013). Food Economics. Routledge.
8. W.C. Frazier and D.C. Westhoff. (2017). Food Microbiology. McGraw Hill Education.

FTT -1.2: Food Biochemistry

Credits: 03

Contact Hours: 56 hrs

UNIT-I

14 hrs

Introduction to Food Biochemistry: Food, Nutrients, Natural biomolecules; Physicochemical properties of water, Importance of water in food, ionization of water, weak acids, and weak bases, water as a reactant, water activity and its influences on food quality and stability.

Enzymes: Definition, Occurrence, Structure, Classification, Functions, Properties; Enzymes in food, Enzyme activity, Factors affecting enzyme activity; Applications of enzyme technology in food industry, Immobilized enzymes.

UNIT-II

12 hrs

Carbohydrate: Classification, Structure; Digestion, Absorption and Transportation; Metabolism; Functions of carbohydrates; Properties of Sugars- crystallization, inversion, hydrolysis, Reducing and non-reducing sugars, Maillard reaction and Caramelization.

Properties of Polysaccharides- amylose and amylopectin, Gelatinization and retrogradation, Starch modification; Properties of pectic substances, cellulose and hemicellulose, gums and dietary fibre.

UNIT-III

16 hrs

Proteins: Classification, Structure; Occurrence; Protein denaturation, Protein purification; Digestion, Absorption and Transportation; Metabolism; Peptides and polypeptide; Nitrogen Balance and methods of Determining Protein Quality; Physico-chemical and functional properties- Cereal protein, Pulse protein, Milk protein, Meat protein, Egg protein, Fish muscle protein, and Oil seed protein; Factors affecting protein properties.

Macronutrient interactions: Protein-protein interaction, Protein-lipid interaction; Macronutrient complexes: Protein-carbohydrate complexes and Protein-lipid complexes; Modified proteins- Physical, chemical, and enzymatic methods, Applications of modified proteins in food industry.

UNIT-IV

14 hrs

Lipids- Classification, Structure, Functions, Digestion, Absorption and Transportation; Metabolism; Physico-chemical properties; Lipids- Vegetable and animal fats, Refining of crude oil and fats, Winterization of fats and oils, Factors affecting lipid oxidation and its biological significance, Lipid-associated metabolic defects and CVD risks.

Vitamins- Fat soluble: A,D,E,& K , Water soluble: Riboflavin, Thiamine, Niacin, B6, B12, Choline, Biotin, Vit C; Bioavailability, Factors affecting vitamin absorption.

Minerals- Macro-minerals: Phosphorous, Calcium, Sodium, Sulphur, Potassium, Magnesium, & Chloride, Microminerals: Iodine, Zinc, Iron, Selenium, Manganese, Molybdenum, Chromium, and Fluoride; Bioavailability, Factors affecting mineral absorption.

FTP -1.2: Food Biochemistry

Credits: 02

Contact Hours: 42 hrs

1. Introduction to instruments and equipments used in Food biochemistry laboratory.
2. Titrimetric analysis – acid base, redox, Vit C.
3. Preparation of buffers and measurement of pH.
4. Qualitative Tests of Carbohydrate- Iodine Test, Fehling's Test, and Molisch's Test.
5. Proximate analysis of Foods.
6. Analysis of lipids: Saponification value, Iodine value, and Free fatty acids.
7. Analysis of water: Alkalinity, Hardness, and Acidity.

References:

1. Donald Voet and Judith G. Voet (2011). Biochemistry, 4th Ed. John Wiley and Sons, Inc., NY, USA.
2. David L. Nelson and Michael M. Cox (2021). Leininger Principles of Biochemistry, Macmillan Learning, NY, USA, 8th Edition.
3. Thomas Devlin (1999). Textbook of Biochemistry with Clinical correlations, John Wiley and Sons.
4. CC. Chatterjee (2020) Human Physiology, CBS publishers, 13th edition.
5. Guyton and Hall (2020). Textbook of Medical Physiology, Elsevier, 14th Edition.
6. Srinivasan Damodaran, Kirk L. Parkin (2017). Fennema's Food Chemistry, CRC Press; 5th edition
7. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer and Gregory J. Gatto, Jr (2015). Biochemistry, W.H. Freeman and Company, NY, USA, 8th Edition.
8. H.S. Ravikumar Patil et al., (2020). A textbook of Human Physiology, Wiley.

FTT -1.3: Principles of Food Processing and Preservation

Credits: 03

Contact Hours: 56 hrs

UNIT-I

12 hrs

Introduction to Food Processing and Preservation: Aim, Objectives, Merits, Demerits, Scope and Importance of food processing and preservation, Causes of deterioration, Principles of food processing,

Fundamentals of Processing: Low temperature, High temperature, Fermentation, Removal of moisture and air, Irradiation, and Milling.

UNIT-II

12 hrs

Advanced Processing: Ultrasound processing, Microwave, Dielectric heating, Hydrostatic pressure processing, Extrusion cooking; Basic principles of food preservation, Methods of preservation, Shelf life, Perishable, Semi-perishable, and Shelf Stable Foods.

Membrane Technology: Introduction, Pressure activated membrane processes-Micro Filtration (MF), Nano Filtration (NF), Ultra filtration (UF), and Reverse Osmosis (RO); Supercritical fluid extraction (SCF)- Concept, property, extraction methods. Application of technology in food processing.

UNIT-III

16 hrs

Thermal Processing: Aseptic processing, Cooking, Ultra Heat Treatment (UHT), Sterilization, Pasteurization, Grilling, Frying, Baking, and Blanching; Canning- Principle, Procedure, Types of containers, pH classification of foods, Heat penetration into cans; Dehydration and Drying- Water activity, moisture sorption isotherm, Osmotic dehydration.

Heat and mass transfer- factors affecting drying process, drying curve, evaporation, thermal properties, Equilibrium Moisture Content (EMC); Methods of drying- Convective drying, Radiation drying, Contact drying, Freeze drying, Superheated steam drying, Driers in food industry- Spray, drum, LSU, Fluidized bed, Deep bed, Flat bed, Solar, Tray, and Tunnel.

UNIT-IV

16 hrs

Low Temperature Techniques: Preservation by chilling- Refrigeration, Cold storage methods, Low temperature preservation of different food products; Physical, Chemical, and Biological changes during refrigeration; Preservation by freezing- Principle, Freezing methods, Freezing curve, Quick and Slow freezing; Quality loss in frozen foods- Freezer burn, Protein denaturation, and Retrogradation; Advantages and disadvantages of freezing, Types of freezer, IQF; Thawing-Types, Effect of food, Changes in food during thawing.

Preservation by Using Preservatives: Food Additives- Definition, Types, Class I and Class II preservatives; Hurdle Technology- Concept and its application.

FTP -1.3: Principles of Food Processing and Preservation

Credits: 02

Contact Hours: 42 hrs

1. Good Laboratory Practice (GLP) defined by FSSAI.
2. Dehydration of Fruits and Vegetables using sun drier or hot air drier and observe the drying characteristics.
3. Refrigerate fruits and vegetables and determine its sensory quality.
4. Deep freeze the non-vegetarian food and determine its sensory quality.
5. To study the effect of microfiltration process on milk quality.
6. Preparation of jam and jelly using pectin rich fruits and evaluate its sensory profile.
7. Apply the osmotic dehydration to any one fruit or vegetable and observe its characteristic changes.
8. Industrial visit to food processing unit.

References:

1. P.J. Fellows. (2009). Food Processing Technology: Principles and Practice. Woodhead Publishing Ltd
2. Bhat, R., Alias, A.K., Paliyath, G. (2012). Progress in Food Preservation. First Edition. Wiley-Blackwell.
3. Subbulakshmi, G., Shobha, A. Udipi (2006). Food Processing and Preservation, First edition, New Age International
4. Sivasankar, B. (2009). Food processing and preservation, Eastern economy edition, Prentice-Hall of India Pvt. Ltd.
5. Manay, S.N., Shadaksharamurthy, M. (2008). Foods: Facts and Principles, 3rd edition, New Age International.
6. Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2010). Basics Food Preparation: A Complete Manual, Fourth Edition. Orient Black Swan Ltd.
7. Sahay K.M and Singh K.K. Unit operations of Agricultural Processing. Vikas Publishing House Pvt. Ltd.
8. Branen, A.L., Davidson PM & Salminen S (2001). Food Additives. 2nd Ed. Marcel Dekker.
9. Gerorge, A.B. 1996. Encyclopedia of Food and Color Additives. Vol. III. CRC Press.

SEMESTER-II

FTT -2.1: Food and Nutrition

Credits: 03

Contact Hours: 56 hrs

UNIT-I

12 hrs

Introduction to Food and Nutrition: Common terminologies and definition, Understanding relationship between food, nutrition, and health, Food classification and functions, Food groups, Balanced diet, BMI, Concept of ICMR – NIN ‘My plate’.

Cooking methods: Objectives of cooking, Preliminary preparations, Cooking methods and their advantages and disadvantages.

UNIT-II

12 hrs

Energy: Nutrient and Energy Density, Energy Units, Determination of energy value of foods-Bomb calorimeter, Energy: Components and requirement.

BMR: Definition, Determination of BMR by different methods, Factors affecting BMR, Reference man and Reference woman, RDA/ EAR for different age and gender.

UNIT-III

16 hrs

Carbohydrates: Composition, Functions, Classification, RDA / EAR, Food Sources, Dietary Fibers; Impact of Cooking on Carbohydrates, Potential health benefits, Health disorders due to its imbalance in the body. Risks associated with Excess of carbohydrates.

Proteins: Composition, Functions of Protein, RDA / EAR, Food Sources; Effect of Cooking on Proteins, Amino acids: Indispensable and dispensable amino acids, Special function of amino acids, Mutual Supplementation, Evaluation of protein quality, Potential health benefits, Risks associated with Excess/ Deficiency of Proteins.

UNIT-IV

16 hrs

Lipids: Composition, Classification, RDA / EAR, Food Sources, Characteristics of animal and vegetable fats; Functions – Essential fatty acids, importance of PUFA and MUFA. Effect of cooking on Lipids. Risks associated with Excess/ Deficiency of lipids.

Vitamins and Minerals: Nutritional classification and Food sources; Nutritional Importance, Health Benefits, Deficiency and Toxicity.

FTP -2.1: Food and Nutrition

Credits: 02

Contact Hours: 42 hrs

1. Identification of foods under basic food groups.
2. Measurement of food materials using standard measuring cups, spoons and weighing.
3. Cooking Methods- Preparing a recipe by Moist heat and Dry heat method (Pressure cooking, Grilling).
4. Cooking Methods- Preparing a recipe by Frying (Deep & Shallow frying) and Combination method.
5. Planning, Preparation and calculation of Nutrient dense food (Energy, iron, calcium, Protein).
6. Anthropometric Measurement - Height, Weight, TSF, MUAC, MUAMC.
7. Calculation of energy requirement for Adult Man and Woman.

References:

1. Srilakshmi, B. (2023). Food science. New Age Publishers.
2. Srilakshmi, B. (2019). Dietetics. New Age Publishers.
3. Sunetra Roday. (2018). Food Science and Nutrition. Oxford University Press India.
4. Potter, N. N., & Hotchkiss, J. H. (2012). Food science. Springer Science & Business Media.
5. NIN, ICMR (1990). Nutritive Value of Indian Foods.
6. NIN, ICMR (2017). Indian Food Composition Tables.
7. Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2010). Basics Food Preparation: A Complete Manual, Fourth Edition. Orient Black Swan Ltd.
8. Recommended Dietary Intakes for Indians, I.C.M.R. 2020 report
9. Whitney E.N., Hamilton E.N. & Raffles S.R., "Understanding Nutrition", 5th ed. West Pub. Co. New York.
10. Mudambi, S.R. & M.N. Rajagopal (2022). Fundamentals of Food and Nutrition. Wiley Eastern Ltc New Delhi-19.

FTT-2.2: Food Microbiology

Credits: 03

Contact Hours: 56 hrs

UNIT-I

12 hrs

Introduction: Scope and evolution of microbiology, History, Microbial classification, nomenclature and identification, Taxonomic groups, General methods of classifying bacteria, Microscopy and microscopes: Smears and staining methods. Introduction to fungi, algae and protozoa and virus.

Pure culture: Methods of isolation of pure cultures; Maintenance and preservation of pure cultures; Culture collections. Growth curve of bacteria, Generation time, and Isolation of micro-organisms: serial dilutions, streak plate, pour plate and spread plate methods.

UNIT-II

16 hrs

Growth Factors and Shelf-life: Significance of microbes in food science, Chemical changes during spoilage: changes in nitrogenous organic compound, non-nitrogenous organic compound, organic acids and other compounds. Factors affecting growth and survival of micro-organisms- Intrinsic factors: pH, water activity, nutrients etc. Extrinsic factors: temperature, relative humidity, Gaseous atmosphere.

Contamination of foods: sources and outbreaks in history. Shelf-life: factors influencing shelf of products, calculation of shelf life, deteriorative reactions and accelerated testing. Inactivation of micro-organisms- D value, z-Value and F-value.

UNIT-III

14 hrs

Fermentation: History of fermented food products, definition, types of fermentation-Lactic acid fermentation, Alcoholic fermentation, Acetic acid fermentation, Butyric acid fermentation and Mixed acid fermentation. Micro-organisms used in food fermentation. Fermentor - Parts of fermentor, types-submerged liquid fermentation and solid-state fermentation.

Concepts of probiotics - role in fermented foods, dairy starter culture, Fermented products- vinegar, sauerkraut, tempeh, miso, soya sauce and Indigenous traditional Indian fermented foods.

UNIT-IV

14 hrs

Microbial Spoilage: Milk and milk products, cereals products, beverages, fruits and vegetables, poultry and egg, sea and marine products, sugars and sugar products, salt and spices products. Canning: spoilage defects, sources of contamination, causative organisms and its prevention control.

Food borne disease - causes, symptoms and indicator organisms. Important bacterial pathogens – *E.coli*, *Salmonella*, *Staph. aureus*, *Clostridium* and their toxins. Mycotoxins –Aflatoxin, Ochratoxin, Patulin, Ergot alkaloids, and DON in foods. Food-borne viruses.

FTP-2.2: Food Microbiology

Credits: 02

Contact Hours: 42 hrs

1. Study of different kinds of Microscopy and learning Micrometry.
2. Cleaning and sterilization of glassware and acquainting with equipment used in microbiology.
3. Preparation of media and techniques of inoculation.
4. Preparation of Staining methods (monochrome staining/ gram staining/ negative staining/ capsule-staining/ flagella staining and endospore staining).
5. Techniques in pure culture (different plating methods).
6. Identification procedures and determination of microbial numbers.
7. Identification of food pathogenic micro-organisms.
8. Visit to fermented food product industries.

Reference:

1. William Frazier, Dennis C Westhoff, K R Aneja. (2025). A textbook of Food Microbiology. MeDTech Science Press A division of Scientific International. Edition:7.
2. Martin R Adams, Maurice O Moss, Peter McClure. (2015). Food Microbiology. Royal Society of Chemistry. Edition:4
3. Thomas J. Montville, Kalmia E. Kniel, Karl R. Matthews. (2017). Food Microbiology: an introduction. American Society of Microbiology Press. Edition:4
4. Larry R Beuchat, Michael P Doyle. (2023). Food Microbiology: fundamentals and Frontiers. Washington, DC ASM Press 2007. Edition:3
5. Neelima Garg, K.L Garg and K.G Mukerji.(2013). Laboratory manual of Food Microbiology. TechSar Pvt.Ltd.
6. Bibek Ray and Arun Bhunia. (2013). Fundamental Food Microbiology. CRC Press. Edition:5
7. Ahmed E. Yousef, Joy G. Waite-cusic and Jennifer J. Perry. (2022). Analytical Food Microbiology, A laboratory Manual. Willey. Edition: 2
8. James M. Jay, Martin J. Loessner and David A. Golden.(2005). Modern Food Microbiology. Springer Nature. Edition:2

FTT-2.3: Fundamentals of Food Engineering

Credits: 03

Contact Hours: 56 hrs

UNIT-I

14 hrs

Food Thermodynamics and Fluid Mechanics: The First and second law of thermodynamics, its applications. Thermodynamic properties of pure substance. Energy, entropy, enthalpy, specific heat, latent heat. Heat and mass transfer: Conduction, convection and radiation.

Psychometry: Thermodynamic properties of moist air, perfect gas relationship, absolute humidity and relative humidity. Fluid flow: Newton's law of viscosity, liquid transport system, Flow characteristics, Concept of flow measurement devices, Properties of Non-Newtonian fluids.

UNIT-II

16 hrs

Unit Operation in Food Processing-I: Size reduction: Rittinger's, Kick's and Bond's equations, types-crusher, ultrafine grinder, hammer mills, attrition, tumbling, colloidal mill, buhrr mill and fluid jet pulverizer - applications and its principles.

Cutting machines (slicing, shredding, dicing, pulping) - Mixing: theory of solid mixing, liquid mixing, types of mixing equipment-mixers for low-medium viscosity, mixers for high viscosity liquid and pastes, mixer for dry powders and its application in food industries. Separation: types of centrifuges, clarifiers, de-sludging and decanting. Filtration: theory and types of filters. Membrane separation- types of membrane modules and its application in food industries.

UNIT-III

12 hrs

Unit Operation in Food Processing-II: Cleaning-wet method and dry method, Grading and sorting: types of grader. Blanching: types, advantages and disadvantages. Peeling: types of peeling methods and its application in food industries.

Frying: theory and principles, shallow or contact frying and deep fat frying, heat and mass transfer in frying, frying equipment; Puffing: Puffing methods, puffing equipment. Roasting: principles of roasting, roasting equipment, advantages and disadvantages of roasting process.

UNIT-IV

14 hrs

Distillation: Principles, continuous flow distillation, vapor-liquid equilibrium, batch/differential distillation, steam distillation in wines and spirits, fractional distillation.

Crystallization and dissolution - Theory and principles, equipment for crystallization applications in food industry. Pasteurization and sterilization: Principles, equipment, process times and T-evaluation. Freezing: Plank and Pharm equation and its application.

FTP-2.3: Fundamentals of Food Engineering

Credits: 02

Contact Hours: 42 hrs

1. Study on various types of heat exchanger.
2. Determination of fineness modules.
3. Preparation of different kind of fried items.
4. Study of different types of mixing (Solid-liquid, liquid-liquid).
5. Colour measurement and determination of CIELAB colour parameters in food products.
6. Analyze the Newtonian and Non-Newtonian fluids in food products.
7. Study on different types of cutting and its impact on cooking properties.
8. Determination of viscosity in food samples.

Reference:

1. P.J. Fellows. (2022). Food Processing technology: Principles and practice. Woodhead Publishing. Edition:5
2. Batty, J.C., Folkman, S.L. (1983). Food Engineering Fundamentals. John wiley and Sons, NewYork.
3. Harper, J.C. (1975). Elements of Food Engineering. AVI, Westport.
4. Heldman, D.R., Lund, D.B. Ed. (1992). Handbook of Food Engineering. Marcel Dekker, NewYork.
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