

Harcourt Butler Technical University

DEPARTMENT OF CHEMICAL TECHNOLOGY - FOOD TECHNOLOGY

SCHOOL OF CHEMICAL TECHNOLOGY

TFT-201: INTRODUCTION TO FOOD TECHNOLOGY

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Syllabus

Module-I: Scope, Opportunities & Challenges

Food Science and Technology, Status of food processing industry in India and abroad Reasons for slow growth of Indian food industry, Market scenario and scope - Dairy, Bakery, Confectionary, Beverages and Snack foods etc Potential and prospects of Indian food Industry.

Module-II: Concept of Food Nutrition and Human Health

Human nutrition and health, Recommended Dietary Allowances (RDA), Factors affecting bioavailability of nutrients, Desirable and potentially undesirable food constituents and their importance. Common nutritional deficiencies such as PEM, iron, vitamin A, iodine, calcium and vitamin D, zinc etc, Emerging common degenerated disorders.

Module-III: Basic biology related to food

Living cells, organization of living system, characteristics, Plant and animal diversity, digestion and absorption of biomolecules.

Module-IV: Role of Biochemistry in Food

Bioenergetics, Energy transformation in living cells, metabolic pathways, Regulation and Control

Module-V: Microbiological Aspects of Food

Characterization, classification and identification of microorganisms, Microscopy, Morphology and Structure, Pure culture and its characteristics, Reproduction Growth and Cultivation, Control of microorganisms, Beneficial uses of microbes in foods, General principles of food hygiene.

Module-VI: Laboratory Experiments

Determination of Moisture, Fat, Protein, Crude Fibre, Reducing Sugars, Vitamins and Minerals, Sample Preparation Techniques, Microscope and its parts, Determination of Adulterants, Analysis of Pesticide residues.

Reference Books and Suggested Readings:

Title	Author
Agriculture Survey of India	The Hindu
Nutritive value of Indian Foods	C. Gopalan

Food Chemistry	L. H. Mayer
Quality control for Food Industry	Kramner & Twigg
Food facts and Principles.	Manay N.S. Shadakshasawamy M
Microbiology	M.J. Pelczar
Principle of biochemistry	A.L. Lehninger

TFT-202: FOOD MICROBIOLOGY

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Syllabus

Module -I: Microorganisms in Foods & Spoilage

Introduction to Food Microbiology, Incidence of microorganisms in foods, Microorganisms of importance in foods, Primary sources of contamination in foods, Intrinsic and Extrinsic parameters of foods that affect microbial growth, Food Spoilage, Causes of Food spoilage, Food Preservation.

Module-II: Preservation of Foods

Principles underlying preservation of foods, Methods of food preservation, Fitness of foods, Determination of thermal resistance of bacterial spores, Radiation-resistant bacteria, Mechanism of action of antimicrobial agents

Module – III: Food Poisoning & Infection

Food poisoning and food-borne infections, Screening, detection and enumeration techniques including rapid detection techniques for Food Micro-organisms including pathogens.

Module-IV: Spoilage and Preservation of Various Food Products

Contamination, spoilage and preservation of Fruit and Vegetable products, Milk and Milk products, Cereal products, Sugar products, , Meat products, Fish and Sea foods, Egg and Poultry products and other foods, Indicators of Food Safety and Quality, Microbiological Standards of foods.

Module-V: Food Plant Sanitation & HACCP

Food Plant Sanitation, inspection and control, Personnel Hygiene, HACCP in Food Industry in controlling microbial hazards, Beneficial microorganisms and their utilization in food fermentation, Introduction to abiotic, biotic and probiotics.

Module-VI: Laboratory Experiments

Preservation techniques of cultures in laboratory., Micrometry and determination of size of microorganisms, Simple and differential staining of microorganisms and their examination, Direct total, viable, and non-viable count of microorganisms in milk and other foods, Pure culture isolation techniques, Determination of Standard Plate Count (SPC) in natural and/or processed foods, Microbiological examination of some selected natural and processed foods, Microbiological

examination of potable water and milk: Total and coliform count, Enumeration of coliform organism in some selected processed foods, Detection of Salmonella in foods, Determination of Phosphatase test in milk.

Reference Books and Suggested Readings:

Title

Modern Food Microbiology,
Food Microbiology
Food Microbiology
Fundamental Food Microbiology
Manual of Food Quality Control- Microbiological Analysis,
Food microbiology

Authors

James M. J.
Frazier W. C. & Westhoff D.C.
Adam M. R. & Moss M.O.
Bibek Ray
Refai M. K.
Roberts D. & Greenwood M

TFT- 301: FOOD BIOCHEMISTRY

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Syllabus

Module-I: Composition of Fruits and Vegetables

Structure and composition of fruit and vegetables: Definition, cellular components, chemical composition and nutritional value.

Module-II: Post Harvest physiology of fruits and vegetables

Physiology and biochemistry of fruit and vegetables: Post harvest handling, physiological development; growth, maturation and senescence, fruit ripening, physiology of respiration, effect and role of ethylene, biochemistry of respiration; aerobic and anaerobic metabolism, chemical changes during maturation

Module-III: Post harvest Handling and storage of fruits & vegetables

Control atmosphere storages, effect of temperature, water loss and humidity, methods for modifying carbon dioxide and oxygen concentration, physiological disorders: low temperature disorders, mineral deficiency disorders.

Module-IV: Biochemistry of muscle and meat

Structure and growth of muscle, chemical and biochemical constitution of muscle, ante-mortem and post-mortem factors affecting quality of meat Biochemical reactions leading to changes in composition, color, flavour and texture of meat.

Module-V: Enzymes: Functions, importance and role in food industry

Application of enzymes in food processing: Endogenous enzymes and their role in modification of foods, enzyme added to foods during processing sources, conversions and specific applications.

Module-VI: Laboratory Experiments

Application of polymerization techniques to synthesize polymers at lab scale, Determination of molecular weight of polystyrene and K-value of PVC by Ostwald Viscometer.

Reference Books and Suggested Readings:

Title	Authors
Food Chemistry	Fennema O.R.
Principles of Biochemistry	Lehninger A.L., Nelson D.L. and Cox MM
Post Harvest Biotechnology of Vegetables	Salunkhe D.K. and Desai B. B
Food Preservation by Modified Atmospheres	Calderon M. and Golan R. V.
Enzymes in Food Technology	Whitehurst R. and Law B. A.

TFT-303: FOOD CHEMISTRY

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Syllabus

Module-I: Water and Carbohydrate

Water in Foods: Structure, Properties, Interactions, Water activity and sorption isotherm, molecular mobility and food stability

Carbohydrates: Classification, Functions, Reactions and properties of simple and complex carbohydrate, Selection of Natural or Modified carbohydrates for incorporation into processed food.

Module-II: Lipids

Classification, Consistency of commercial fat, Lipolysis, Auto oxidation, Thermal decomposition and effect of ionizing radiation, Refining of oils, Modification of oils and fats, Role of food lipids in flavor, Nutritional and safety aspects of natural and modified fats.

Module-III: Proteins

Classification, nutritional and functional properties of food proteins, Nutritive value and its determination, Chemical reactions and interactions of amino acids and proteins, De-naturation and its implications, Functional properties of food proteins, Modification of food proteins in processing and storage and its implications.

Module-IV: Vitamins, Minerals, Pigments and Flavors

Vitamins, Minerals, Pigments and Flavors: Sources, Functions, Deficiency diseases, Chemistry and stability of water and fat-soluble vitamins during processing, Chemical properties of minerals and their bioavailability, Enrichment and fortification. Natural pigments in foods and their retention in processed foods, Flavoring constituents in foods, Development of process and reaction flavor volatiles.

Module-V: Food Additives

Definitions, sources, uses and functions and regulatory aspects of food additives

Module-VI: Laboratory Experiments

1. Quality analysis of water
2. Determination of moisture content in food by hot air oven method
3. Non-enzymatic browning reactions and its determinations
4. Determination of rate of hydrolysis of sucrose/starch
5. Determination of free fatty acid content and oxidative rancidity in fats and oils
6. Determination of heat stability of vitamin C
7. Determination of functional properties of proteins
8. Determination and identification of additives added to food
9. Determination and identification of adulterants in some foods
10. Determination of salt content in processed products

Reference Books and Suggested Readings:

Title	Author(s)
Food Chemistry	O.R. Fennema
Food Facts and Principal	N. Shakuntala Manay & M. Shadaksharaswamy
Food Chemistry	L.H. Meyer
Food Chemistry	H.D. Belitz and W. Grosch
Basic Food Chemistry	Lee
Principles of Biochemistry	Lehninger
Food Additives	S.N. Mahindru
Hand book of analysis and quality control for fruits and vegetable products	S. Ranganna

TFT-302: PRINCIPLES OF FOOD PRESERVATION

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Syllabus

Module-I: Introduction and need of food preservation

Aims and objectives of preservation of foods, Degree of perishability of unmodified foods, Causes of quality deterioration and spoilage of perishable foods: Microbial, Physical, Chemical & Miscellaneous, wastage of foods. Concept of Water activity, Intermediate moisture Food, osmosis and diffusion.

Module – II : Preservation of foods by low temperatures

Chilling temperatures: Consideration relating to storage of foods at chilling temperatures, Applications and procedures, Controlled and Modified atmosphere storage of foods, Post storage handling of foods. Freezing temperatures: Freezing process, Slow and fast freezing of foods and its consequence other occurrences associated with freezing of foods. Technological aspects of prefreezing, Actual freezing, Frozen storage and thawing of foods,

Module –III : Preservation of foods by high temperatures

Basic concepts. Lethality requirement and assessing the adequacy of a thermal process: D value, Z value ,F value etc, Blanching, Pasteurization: Batch and continuous. Commercial sterilization of foods: Conventional canning process, batch and continuous retorts, aseptic processing.

Module – IV: Preservation by water removal

Principles, Technological aspects and application of evaporative concentration process; Freeze concentration and membrane process for food concentrations. Principles, Technological aspects and application of drying and dehydration of foods, Cabinet, tunnel, belt, bin, drum, spray, vacuum, foam mat, fluidized-bed and freeze drying of foods.

Module – V: Preservation by Non-thermal methods

Principles, Technological aspects and application of sugar and salt, Natural food preservation system, Antimicrobial agents (Nitrates, Benzoates, Propionates, Sorbates etc), mechanism of actions of different preservatives, Biological agents, nonionizing and ionizing radiations in preservation of foods. Hurdle technology.

Reference Books and Suggested Readings:

Title

Food Process Engineering & Technology
Food Processing and Preservation
Food Processing Technology : Principles and Practice
Food Processing Technology : Principles and Practice
Fruits and Vegetables processing: Improving quality
Introduction of Food processing Engineering

Author

Zeki Berk
B. Sivasankar
P.J Fellows
M.Shafeiur Rahman
Wim Jongen
P. G. Smith

TFT-304: TECHNOLOGY OF CEREALS, PULSES AND OILSEEDS

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Syllabus

Module-I: Composition and Structure

Production trends, Composition, structure and processing characteristic of cereal grains, Legumes and oilseeds, Post harvest, Post processing practices for their safe storage.

Module-II: Paddy Processing and Products

Parboiling and milling of paddy, curing and aging of rice, processed rice products.

Module-III: Wheat Processing and Products

Wheat and its quality characteristics for milling into flour and semolina, Flour milling, Turbo grinding and air classification, Flour grades and their suitability for baking purposes, Assessment of flour quality and characteristics, Milling of Durum wheat, Ingredients, Technology and quality parameters for baked products: Bread, biscuits and cakes; Breakfast cereals, Macaroni products.

Module-IV: Processing of Coarse Cereals and Legumes-Pulses

Dry and Wet milling of corn, Starches and its conversion products, malting of barley, Pearling of millets, Milling of legume-pulses by traditional and improved processes.

Module-V: Processing of Oilseeds

Processing of oil seeds for direct use and consumption, Oil and protein products, Refining, Hydrogenation and Interstratification of oil, Processing of de-oiled cake into protein concentrates and isolates, Textured protein, Functional protein preparations, Peanut butter, Margarine and Spread.

Module-VI: Laboratory Experiments

1. Determination of physical properties of grains
2. Determination of physical properties of pulses
3. Evaluation of quality of rice and wheat flours
4. Estimation of Gluten content of flour
5. Determination of average size of pulses flour by sieve analysis
6. Determination of cleaning efficiency of a grading screen
7. Preparation of bread
8. Preparation of biscuit
9. Preparation of cake
10. Preparation of macaroni products and other breakfast cereal products

11. Preparation of Soy Milk and Tofu (Soy Paneer)

Reference Books and Suggested Readings:

Title	Author
Mysore Manuals on Rice and its Processing	C.F.T.R.I.
Food Science	N.N. Potter
Cereal Technology	S.A. Matz
Bakery Technology	S.A. Matz
Cereals and Cereal Processing: Chemistry and Technology	DAV Dendy and B.J. Dobrazczyk
Cereal Technology	Kent

Practical manual on Processing of Pulses and Oilseeds, Practical manual on Processing of Cereals and Value Addition, published by Indian Institute of Food Processing Technology (<http://www.iifpt.edu.in/uploads/1-to-2-week-modules.pdf>)

TFT-306: FRUITS, VEGETABLES AND PLANTATION PRODUCTS

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Syllabus

Module – I: Post Harvest Handling of Fruits & Vegetables

Current status of production and processing of fruits and vegetables, Chemical composition, pre- and post-harvest changes, harvesting and maturity standards for storage and desirable, characteristics of fruits and vegetable for processing. Role of plants growth regulators in relation to storage, Physical and chemical treatment to increase the shelf-life, Conditions for transportation and storage, Disease and injuries during marketing, Biosynthesis of flavours, Flavour characteristics.

Module – II: Preservation of Fruits & Vegetables

Low temperature preservation, Types of cold preservation, freezers and freeze concentrates, Thermal processing: Canning and bottling, spoilage of canned foods, detection and control, Drying and dehydration of fruits and vegetables.

Module – III: Processing Technology of Fruit & vegetable based Products

Juices, pulps, Concentrates, powders, Squashes, cordials and other beverages. Jams, Jellies, Marmalades, Preserves, candies and crystallized fruits. Tomato processing: Puree, Paste, Ketchup, Sauce and soup. Chutneys, pickles and other products.

Module – IV: Processing Technology of Spices & Plantation products.

Spices: Composition, Structure and characteristics. Preservation and processing of major and minor spices of India; whole spice, Spice powder, Paste and extracts, Spice oils and oleoresins. Composition, Production and processing of Tea leaves: Black tea, Green tea and Oolong tea, Instant tea. Production and processing of coffee cherries: wet and dry methods, grinding, storage and preparation of brew, Soluble/Instant coffee, Use of chicory in coffee, decaffeinated coffee. Composition, structure and characteristics of Cashew-nut and other dry fruits.

Module – V: Processing of Cocoa & Cocoa Products

Production, processing and chemical composition of cocoa beans: Cleaning, roasting, alkalization, cracking and fanning, Nib grinding for cocoa liquor, cocoa butter and cocoa powder. Manufacturing process for chocolate: Ingredients, Mixing, Refining, Conching, Tempering, Moulding etc. to obtain chocolate slabs, chocolate bars. Enrobed and other confectionary products.

Module – VI: Laboratory Experiments

Processing and preservation of fruit juice, RTS, Cordial, Nectar, Squash and other beverages, processing and preservation of jam, jelly, marmalade, preserve, crystalized fruit, processing and preservation of chutney, pickle. Processing and preservation of tomato ketchup puree. Canning of peas, drying of vegetables, extraction of volatile oil from spices, total phenolic content of tea.

Reference Books and Suggested Readings

Title	Author
Advances in Fruit Processing Technologies	Jongen
Advances in Postharvest Fruit and Vegetable Technology	Ron B.H. Wills., John Golding
Preservation of fruits and vegetables	Girdharilal, Siddappaa, G.S.
Handbook of analysis and quality control for fruits and vegetable products	Ranganna S
Foods: Facts and Principles, New Age Publishers.	Manay, S. & Shadaksharaswami
Introduction to spices, plantation crops, Medicinal and aromatic plants	Kumar N.

TFT-401: FOOD SAFETY AND QUALITY CONTROL

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Syllabus

Module-I: Food Quality and Quality Evaluation

Ways of describing of Food Quality, Quality control and Quality Assurance functions, Total Quality Control (TQC) and the role of management/TQM, Statistical quality control, Quality

costs. Sensory evaluation of foods, Instrumental measurements of sensory attribute of foods: Engineering properties. Textural characteristics, Texture profile analysis, Correlation between instrumental and Sensory analysis of food quality attributes

Module-II: Food Safety

Operational sense of food safety, Potential Food derived health hazard- Microbial contamination, Nutritional Imbalance, Pesticide residues, Environmental Contamination, Naturally occurring compounds and permitted food additives, Consumer awareness about food safety, safety of various food categories: Fruits and vegetables, milk and milk products, meat Fish, Sea foods, Egg and poultry products.

Module-III: Food Standards and Regulations

Food standards and Specifications: Compulsory and voluntary trade and Company standards. Consumer, company, In-process and finished product specifications, AgMark, and BIS Standards, Food regulations: Food Safety and Standards Act (2006) and subsequent regulation 2012 onwards

Module-IV: Global Scenario of Food Safety Management

Introduction to Codex Alimentarius and FSIS, Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Good Agricultural Practices (GAP), ISO series, HACCP systems: Global standards for contaminants and toxins in foods.

Module-V: Food safety management system

Introduction, prerequisite program of food safety management system, understanding and implementation of food safety management system in food industries, understanding and implementation of ISO 22000.

Module-VI: Laboratory Experiments

Sensitivity tests (Threshold/Dilution) to measure individual ability for sensory analysis, Difference tests to evaluate qualitative and quantitative differences and/or preference between test products, Assessment of quality of wheat flour (Water Absorption Power, Gluten Content, Sedimentation Value etc.), Evaluation of quality of Bakery Products: Bread, Biscuits, Cakes etc. Quality evaluation of Dairy Products (Over run, fat content, Specific gravity), Quality assessment of Jam, Jelly, Marmalades, Squashes& Cordials and Food beverages.

Reference Books and Suggested Readings:

Title	Author
Food Quality Assurance: Principles and Practices	Inteaz Alli
Rheology and Texture in Food Quality	J.M.DeMan
Food Analysis : Theory and practice	Y.Pomeranz
Principles of Sensory Analysis of Food	M.A. Amerine

TFT-403: TRADITIONAL AND FERMENTED FOODS

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Syllabus

Module-I: Indian Traditional Foods

Indian traditional sweet, savory and snack food products: Sweetmeats, namkins, potato products, papads, idli, dosa and dhokla.

Module-II: Preparation and Maintenance of Microbial Culture

Preparation and Maintenance of bacterial, yeast and mold cultures for food fermentations, Lactic acid bacteria-activities and health-promoting effects, Mushrooms: Cultivation and preservation.

Module-III: Fermented Dairy, Meat and Fish Products

Fermentation-Definition and types, Microorganisms used in food fermentations, Dairy Products: Cheeses, curd & yoghurt, Butter milk and the fermented milks, Fermented meat and fish products, Spoilages, defects and their control.

Module-IV: Fermented Cereals, Fruits and Vegetables Products

Production of beer, wines, cider and vinegar, Fermented vegetables.

Module-V: Industrial microbial products

Production of Baker's yeast, Microbial proteins, fats and enzymes, Oriental fermented foods.

Reference Books and Suggested Readings:

Title	Author
Handbook of Indigenous Fermented Foods	K.H. Steinkrus
Outlines of Dairy Technology	De Sukumar
Industrial Microbiology	Prescott & Dunn
Industrial Microbiology	L.E. Casida
Food Microbiology	W.C. Frazier and D.C. Westhoff

TFT 405-: FOOD PROCESS AND PRODUCT DEVELOPMENT

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Syllabus

Module I Concept of product development

Innovation and product development concept. Generation of ideas. Desk Research. Screening/appraisal of initial ideas.

Module II Analysis of market

Detailed study of product and market, Planning and development activities and evaluating them.

Module III Development of product

Development of prototype product and its testing for acceptance.

Module IV Development of process

Development of process and planning for production trials. Planning the test market. Actual production trials and test marketing. Evaluation of test results.

Module V Launching

Launching of the product. Advertising and marketing plans. Suggestions for improving success.

Suggested References & Books:

Title

Food product development

Hydrocolloids: Practical Guides for the Food Industry

Food Processing Technology

Food Product Development: Based on Experience

New Food Product Development: From

Concept to Marketplace

Author(s)

Earle, M., Earle, R., & Anderson, A.

Hoefler, A.C.

P.J Fellows

Side, C.

Fuller, G.W.

TFT-407: FOOD PROCESSING WASTE MANAGEMENT

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Syllabus

Module-I: Standards and Acts

Food industry wastes, Food waste treatment, ISO 14001 standards, Standards for emission or discharge of environmental pollutants from food processing Industries as per Environment (Protection) Act, 1986, Elements of importance in the efficient management of food processing wastes.

Module-II: By products and their utilization

Characterization and utilization of by-products from cereal, pulses, oilseeds, fruits and vegetables, plantation products, fermented foods, milk, fish, meat, egg and poultry processing industries.

Module-III: Food Industry Waste and Environmental Pollution

Characterization of food Industry effluents, Physical and chemical parameters, Oxygen demands and their interrelationships, Residues (solids), Fats, Oils and grease, Forms of nitrogen, sulphur and phosphorus, Anions and cations, Surfactants, Color, Odor, Taste, Toxicity, Unit concept of treatment of food industry effluent, Screening, Sedimentation /Floatation as pre and primary reactants.

Module-IV: Biological Oxidation

Objectives, Organisms, Reactions, Oxygen requirements, Aeration devices Systems: Lagoons, Activated sludge process, Oxidation ditches, Rotating biological contactors and their variations and advanced modifications.

Module-V: Waste Water Management

Waste water treatment systems, Physical separations, Micro-strainers, Filters, Ultra filtration and reverse osmosis, Physico-chemical separations: activated carbon adsorption, Ion-exchange electro dialysis and magnetic separation, Chemical oxidation and treatment coagulation and flocculation, Disinfection, Handling disposal of sludge.

Reference Books and Suggested Readings:

Title	Author
Food Processing Waste Management Environment (Protection) Act	J.H. Green
Proceedings of the Symposium on By-products From food Industries: Utilization and Disposal	AFST(I) & CFTRI
Environmental Protection and Laws	H. Jadhav & V.M. Bhosale
Environmental Management	K.D Wanger
Waste Water treatment	M.N Rao & A.K. Datta

TFT 409 :-QUALITY MANAGEMENT OF FROZEN FOODS

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Syllabus

Module I: Theoretical and Experimental Aspects of Food Freezing

Introduction, Food freezing systems, overview of physicochemical aspects of Freezing, Future trends in Food freezing Processes Measurement and Interpretation of the Glass Transition in Frozen Food, Modeling of Food Freezing.

Module II: Quality Losses associated with Frozen Food

Moisture Migration and Ice Recrystallization in Frozen Foods, Freeze-Cracking, Quality Deterioration in Frozen Foods Associated with Hydrolytic Enzyme Activities, Protein Denaturation and Functionality Losses, Lipid Oxidation: Flavor and Nutritional Quality Deterioration in Frozen Food, Relationship of Frozen-Food Quality to Microbial Survival.

Module III: Techniques to Minimize Quality Losses

Cryoprotectants for Improving Frozen-Food Quality, Antioxidants and Their Application to Frozen Food, Edible Coatings and Films Product Composition and the Quality of Frozen Foods, Role of Packaging in Quality Preservation of Frozen Food,

Module IV: Monitoring of Quality in Frozen Food

Physical and Ultrastructural Measurement, Chemical Measurements of Frozen Foods, Sensory Evaluation Methods to Measure Quality of Frozen Food, Shelf-Life Testing: Procedures and Prediction Methods

Module V: Strategies to Ensure Frozen Product Quality Today and Tomorrow

Consumer Acceptance of Frozen Foods: Market Segmentation , Quality in Frozen Foods from the Consumer's Perspective, Consumer Education, Marketing Frozen Foods, Total Quality Management for the Frozen-Food Industry, Quality Enhancement

Reference Books and Suggested Readings:

Title	Author
Quality in Frozen food	Marilin C. Erikson
The Freezing Preservation of Foods	Tressler D.K.& EversC.F
Cold and Chilled Storage Technology	Clive DellinoD.J
Food Processing Technolgy – Principles and applications	Fellows, P.J
Frozen Food Technology	Ed.Mallet C.P

TPL 411- : TECHNOLOGY OF MILK & MILK PRODUCTS

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Syllabus

Module -I: Basic Idea of Milk

Composition of milk and factors affecting it, Physico-chemical characteristics of milk and milk constituents, production and collection, cooling and transportation of milk, White revolution, Present milk industry scenario and its future, Milk and milk products and its national and international standards.

Module -II: Processing of Market Milk

Reception, chilling, clarification and storage, Bactofugation: Theory and microbiology, Homogenisation: Definition, pretreatments, theories, synchronization of homogenizer with operation of pasteurizer (HTST), Definition and description of processes: Pasteurization, thermisation, sterilization, UHT Processing, Product control in market milk plant, Defects in market milk. processing

Module -III: Packaging, Storage, Distribution and Cleaning

Packaging storage and distribution of pasteurized milk: whole, standardized, toned, double toned and skim milk, Test for milk quality and adulteration, UHT processed milk, flavored, sterilized milk, cleaning and sanitation of dairy equipments.

Module -IV: Milk Products

Cream: Definition, classification, processing and physico-chemical properties of Cream, Butter, Butter oil and Ice cream.

Module -V: Dried Milk Products

Evaporated and condensed milk: Method of manufacture, packaging and storage. Roller and spray drying of milk solids, flow ability, reconstituability, dispersability, wet ability, sink ability and appearance of milk powders.

Reference Books and Suggested Readings:

Title	Author
Food Processing Waste Management Environment (Protection) Act	J.H. Green
Outlines of Dairy Technology. Oxford University Press	De Sukumar
Dairy Processing - Improving Quality; Woodhead Publishing	G. Smit
Dairy Technology- Principles of Milk Properties and Processes; Marcel Dekker Inc.	P. Walstra., T.J. Geuits., A. Noomen, A. Jellema and M.A.J.S. Van Boekel
Dairy India Year Book, 2007	R.P Gupta
Milk and Dairy Product Technology; Marcel Dekker Inc.	E. Spreer

Modern Dairy Technology, Vol. I Advances in Milk R.K Robinson
processing

TFT-413: NUTRACEUTIAL AND FUNCTIONAL FOODS

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Syllabus

Module-I: Technological Aspects of Nutraceuticals and functional Foods

Defining nutraceuticals and functional foods, nature, type and scope. Nutraceuticals and functional foods applications and their health benefits, classification based on chemical and biochemical nature with suitable and relevant descriptions.

Module-II: Nutraceuticals for specific diseases

Food recommended and restricted in metabolic disorders and disturbances, gastrointestinal disorders; fever and infection; liver, gall, bladder and pancreatic disturbances; blood, circulatory and cardiac diseases; urinary and musculoskeletal diseases; allergies.

Module-III: Functional role of food components

Antioxidants, phytochemicals, isoflavones, lycopenes, their role in Nutraceuticals and functional foods, dietary fibers and complex carbohydrates as functional food ingredients. Proteins as a functional food ingredients, probiotic foods and their functional role.

Module-IV: Role of Specific Food Products as a Functional Food

Herbs as functional foods, health promoting activity of common herbs. Cereal products as functional foods- Oats, Wheat bran, rice bran etc. Functional vegetable products, oil seeds and sea foods. Coffee, tea and other beverages as functional foods/ drinks and their protective effects

Module-V: Legal Aspects of Nutraceuticals

Effects of processing and storage, interaction of various environmental factors on the potentials of such foods. Marketing and regulatory issues of Nutraceuticals and functional foods and. Recent developments and advances in the area of Nutraceuticals and functional foods.

Reference Books And Suggested Readings:

Title

Handbook of Nutraceutical and Functional Foods

Author

Wildman REC

Angi-angiogenic Functional and Medicinal Foods	Losso JN
Handbook of Nutraceuticals	Pathak YV
Innovations in Healthy and Functional Foods	Ghosh D et al
Nutrition and Dietetics	S. A. Joshi

TFT 415: NUTRITIONAL ASPECTS OF NATURAL AND PROCESSED FOODS

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Syllabus

Module-I: Basic concept of nutrients of food & RDI

Food and its functions, Role of nutrients, Effects of deficient or excess intake of the individual essential nutrients. Recommended Dietary Intakes (RDI) and its uses. Factors affecting nutritional requirement of an individual.

Module-II: Composition of Foods

General and Specific for different foods of plant and animal origin. General causes of loss of nutrients. Nutritional changes during processing & storage and their implications. Potentially undesirable constituents in foods. Restoration, Enrichment, Fortification and Supplementation of foods.

Module -III: Fate of Food in human body

Digestion, Absorption and Metabolism of Carbohydrate: Glycolytic pathway, TCA cycle, ETP, PPP. Protein & lipid digestion, absorption and metabolism. Digestion, absorption and metabolism of Vitamins and Minerals.

Module-IV: Therapeutic diet and its role

Balanced diets for normal individuals, Therapeutic diets for people suffering from various ailments and disorders, Functional foods.

Module-V Nutritional and Sensory qualities of Food

Assessment of calorific value and nutritional quality of natural and processed foods by chemical and biological means. Sensory qualities and acceptability of foods.

Reference Books and Suggested Readings:

Title	Author
Nutrition and Dietetics	Shubhangini A.Joshi
Nutritive Value of Indian Foods	Gopalan C and others
Food Chemistry'	Fennema O.R
Basic Nutrition in Health & Disease	P.S. Howe,& W.B. Saunders
Food and Nutrition	Swaminathan M

TFT-402: INNOVATIVE TECHNIQUES IN FOOD PROCESSING

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Syllabus

Module-I: Membrane technology

Introduction to pressure activated membrane processes: microfiltration, UF, NF and RO and their industrial application, Supercritical fluid extraction concept, property of near critical fluids NCF, extraction methods.

Module-II: Microwave and Radio Frequency Processing

Definition, Advantages, mechanism of heat generation, application in food processing: microwave blanching, sterilization and finish drying.

Module-III: High Pressure Processing,

Concept, equipments for HPP treatment, mechanism of microbial inactivation and its application in food processing, Ultrasonic processing: Properties of ultrasonic, application of ultrasonic as processing techniques.

Module-IV: Ohmic and Radiation heating

Concept and technology of ohmic heating, IR heating, inductive heating and X-rays in food processing and preservation,

Module-V: Hurdle technology

Concept of physical and chemical hurdles, Principle of hurdle technology and its application in food preservation, Shelf-stable food products

Reference Books and Suggested Readings

Title	Author
Emerging Technologies for Food Processing. Novel Food Processing Technologies	Da-Wen Sun M. P. Cano, M. S. Tapia, and G. V.
Innovation in Food Engineering: New Techniques and Products,	Maria Laura Passos, Claudio P. Ribeiro
Nonthermal Processing Technologies for Food	Howard Q. Zhang. et al., 2000
Non-thermal Food Engineering Operations Food Processing Technologies: Impact on Product Attributes	Enrique Ortega-Rivas Amit K. Jaiswal

TFT-404: COMPUTER APPLICATION IN FOOD PROCESSING

L	T	P	C
3	1	0	4

Syllabus

Module-I: Basics of Computer software and Hardware

Introduction to computer hardware and operations, CPU, input and output devices, memory, secondary storage, operating system, spreadsheet fundamentals, data base management, graphics application.

Module-II: Data analysis

Classical and recently developed statistical procedures, basic principles of statistical inference, Problems of estimation, hypothesis testing, large sample theory, probability, regression-linear and nonlinear.

Module-III: Instrumentation and process control

Computer based instrumentation for data acquisition and their control, virtual instruments, reliability and fault finding, concept of process control -first order, second order, and third order processes

Module-IV: Modelling and simulation

Concept, advantages and limitations of dimensional analysis, Models - Types of models and modelling approaches, features of models, Curve fitting method of least squares, estimation of

coefficients of simple determination and simple correlation, properties of least square residuals. Simulation and simulation language.

Module-V: New techniques of computation

Response surface methodology, artificial neural network, fuzzy logic, genetic algorithm, finite difference finite element, computational fluid dynamics: concepts and their application in food processing with examples.

Reference Books and Suggested Readings:

Title

Elements of Practical Statistics
Basic Statistics
Computer Applications in Food Technology
PC based Instrumentation and control
Design and analysis of experiments

Author

Kapur, K.
Simpson, O.J.
Paul Singh R
Mike Tooley
Douglas C. Montgomery

TFT-406: FOOD PACKAGING AND STORAGE ENGINEERING

L	T	P	C
3	1	0	4

Syllabus

MODULE-I: Introduction of packaging

Concept of packaging, Important functions of package, Packaging laws and regulations: Printing techniques; Package labeling: functions and regulations; Environmental aspect of food packaging

MODULE-II: Packaging materials and forms

Glass containers and closures, Metal containers: tin-plate containers, tin free steel containers, aluminum and other metal containers. Protective lacquers and coatings for metal containers. Wooden crates, plywoods, cellulosic papers, pouches, bags and card board / corrugated paper boxes. Rigid and flexible plastics containers and films and their mechanical sealing and barrier properties.

MODULE-III: Advances in Food Packaging

Selection of Packaging materials, forms and machinery for various food commodities: Fruits and vegetable and their products, Milk and milk products, Meat, fish, egg etc., cereals, pulses and oil seeds products, confectionery etc. Evaluation of quality, safety and interaction with foods of various types of packaging materials. Gas, vacuum, CAP, MAP and aseptic packaging, Tetra packing, Smart packaging, Intelligent Packaging, Active Packaging and Antimicrobial packaging, Retortable pouches, biodegradable and edibles packaging materials and films.

MODULE-IV: Testing of Packaging Material

Destructive & Non destructive test of rigid, semi rigid and flexible packaging material: tensile strength, compression, bursting, tear and impact test for packages, integrity testing. Cushioning effect on packaged foods, deterioration of packaged foods, shelf life study for packaged foods. Corrosion and toxicity of packaging material.

MODULE-V: Storage of foods

Design parameter for different storage bins for different grains, Milk silo, Design parameter, selection of parameter for designing cold storage for foods different storage. Spoilage of fruits & vegetables during transportation & storage and its prevention. Factors affecting quality of grain during storage. Causes and prevention of spoilage of grain during storage.

Reference Books and Suggested Readings:

Title	Author(s)
Food Packaging: Principles and Practice	Robertson G.L.
Food Packaging Materials	Mahadeviah M. and Gowramma R.V.
Principles of Food Packaging	Saclarow S. and Griffin R.C.,
Food and Package Engineering	Scott A. Morris
Food Packaging and Preservation	Alexandru Grumezescu Alina Maria Holban

TFT-408 : PRINCIPLES OF FOOD ANALYSIS

L	T	P	C
3	1	0	4

Syllabus

MODULE-I: General information

Introduction to Food Analysis, United States Government Regulations and International Standards Related to Food Analysis , Nutrition Labeling, Evaluation of Analytical Data, Sampling and Sample Preparation.

MODULE-II: Compositional Analysis of Foods

Determination of moisture in foods by different methods, ash content of foods, wet, dry ashing, microwave ashing methods, significance of sulphated ash, water soluble ash and acid insoluble ash in food , Determination of total fat in foods by different methods Moisture and Total Solids Analysis, Ash Analysis, Protein Analysis, Carbohydrate Analysis, Vitamin Analysis, Traditional Methods for Mineral Analysis.

MODULE-III: Chemical Properties and Characteristics of Foods

pH and titrable acidity, fat characterization , protein separation and characterization procedures, application of enzymes in food analysis, immunoassays, analysis of food contaminants, residues and chemical constituents of concern, analysis for extraneous matter, determination of oxygen demand

MODULE-IV: Spectroscopy & Chromatography

Basic principles of spectroscopy, ultraviolet, visible and fluorescence spectroscopy, infrared spectroscopy, atomic absorption and emission spectroscopy, mass spectrometry, nuclear magnetic resonance and electron spin resonance, Basic principles of chromatography, chromatographic techniques: paper, thin-layer and column chromatography. High performance liquid chromatography (HPLC) and gas chromatography (GC).

MODULE-V: Physical Properties of Foods

Rheological principle for food analysis, thermal analysis: Differential Scanning Calorimetry Modulated DSC, color analysis.

References:

Title

Food Analysis, 3rd Edition

Food Analysis : Theory and Practice 3rd Edition

Chemical Analysis of Food and Food Products

Handbook of Food Analysis, 2nd edition

Food Analysis by HPLC. 2nd Edition

Methods of Analysis for Functional Foods and Nutraceuticals

Author

Nielson, S. Suzanne

Pomeranz, Yeshajahu and

Clifton E. Meloan

Jacobs, Morris B

Nollet, Leo M.L.

Nollet, Leo M.L

Hurst, Jeffrey W