

**SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR FOOD
TECHNOLOGY and FOOD PROCESSING, HIGHER EDUCATION
DEPARTMENT, JAMMU & KASHMIR**

Unit 1: Food Preservation and Processing

Principles and methods of food preservation, types of preservatives and their applications in food processing. Significance of D-value, Z-value and F-value in preservation of foods, Intermediate moisture foods, Processing and preservation by heat – blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric heating, microwave heating, ohmic heating. Processing and preservation by low-temperature- refrigeration, freezing, Controlled Atmosphere, Modified Atmosphere, and dehydro-freezing. Processing and preservation by drying, and concentration. Membrane technology: micro-filtration, Ultra-Filtration, Nano-Filtration and Reverse Osmosis. Processing and preservation by non-thermal methods- irradiation, high pressure processing, pulsed electric field, pulsed X-rays, hurdle technology, thermo-sonication, ultrasound, bacteriofugation, bacteriocins in food processing.

Unit 2: Food and flavor Chemistry

Carbohydrates: classification, monosaccharides, oligosaccharides, and polysaccharides-starch, cellulose and pectic substances, molecular structure of starch, gelatinization, pasting, retrogradation and staling, resistant starch, polyols, modified starches, cyclodextrins, gums-Xanthan gum, gum Arabic, locust bean gum, carrageenan. Proteins: classification of amino acids and proteins, protein structure, denaturation and denaturing agents, functional properties of proteins, protein quality and digestibility. Lipids: saturated and unsaturated fatty acids, phospholipids, types of oxidation (autooxidation, photooxidation and enzymatic), major toxic lipid oxidation products, measurement of lipid oxidation, hydrogenation, polymorphism in lipids, fat mimetics and fat replacers. Anti-oxidants: sources, classification, mechanism of action. Water activity and its relevance to deteriorative processes in foods, sorption phenomenon, hysteresis. Non-enzymatic browning (NEB): factors affecting NEB and its control.

Flavor chemistry: Sources of flavours (natural, processed and added), flavour emulsions, lipid derived flavours, flavour of vanilla, Oleoresin and essential oil extraction, flavor reversion.

Unit 3: Food Engineering

Thermal properties of foods such as specific heat, thermal conductivity and thermal diffusivity. Mechanism of heat transfer in conduction, convection and radiation. Fourier's law, steady state and unsteady state conduction, Convective heat transfer coefficient, thermal boundary layer, Nusselt number, Prandtl number, heat transfer by forced convections, free convection, laws of radiation, heat exchangers, Newtonian and non-Newtonian fluids, Reynolds number, Size reduction, theory and laws of size reduction, size reduction equipments- ball mill, disc mill, hammer mill, Cryogenic freezing and IQF; Food freezing equipment such as air blast freezers, plate freezers, fluidized bed freezers and immersion freezers, Cryogenic freezing, drying curve, types of dryers and effect of drying on food quality.

Unit 4: Food analysis and Quality management

Texture analysis of foods, Colour measurements- CIE, Munshell and Hunter lab, Atomic absorption Spectroscopy (AAS), and Inductively Coupled Plasma (ICP) Spectroscopy, Viscosity measurements, Rheological testing of dough- Farinograph, Mixograph, Extensograph, Amylograph / Rapid Visco Analyzer, Falling number, Differential scanning calorimetry, Nuclear magnetic resonance (NMR), Chromatographic methods in food analysis- column, size exclusion, ion exchange chromatography, HPLC, Gas chromatography, LC-MS. X-ray diffraction analysis of foods. Concepts of quality management: Objectives, importance and functions of quality control; Sensory evaluation methods, discriminative and descriptive tests. Quality management systems in India; Food Safety and Standards Act, 2006, Codex Alimentarius Commission, ISO, FSMS-ISO-22000-2005, Quality assurance, Total Quality Management; GMP/GHP; Sanitary and hygienic practices; HACCP, physical, chemical and biological hazards in foods, food adulteration and methods of detection.

Unit 5: Food Microbiology

Factors affecting microbial growth in foods-intrinsic and extrinsic factors, bacterial growth curve, Microbial spoilage of foods, spoilage microorganisms of milk, fruit & vegetables, cereals, meat and poultry, enzyme immobilization, Fermentation technology-types of fermentation, technology of fermented foods including vinegar, yogurt, curd, cheese, pickles, sauerkraut, probiotics and prebiotics, single cell proteins, food borne diseases, Food intoxication and food borne illness, microbial toxins-aflatoxins, ochratoxins and patulin

Unit 6: Cereal, Pulses and Oilseed Processing

Structure and composition of cereals, pulses and oilseeds. Wheat processing- types of wheat, their suitability for processing, hydrothermal treatment/conditioning, milling, technology for manufacture of bakery products i.e., bread, biscuits, cakes and pasta, role of various ingredients, maturation, flour improvers, bleaching agents and enzymes in baking. Rice Processing-Modern Rice Milling, by-products of rice milling and their utilization, parboiling of paddy, physico-chemical changes during parboiling and its effects on rice quality, Barley: Pearling, malting, brewing, health benefits of β -glucan. Corn: wet and dry milling, manufacture of high fructose corn syrup. Millets and Pulses: nutritional significance of major millets, anti-nutritional factors in pulses, different unit operations of pulse and millet processing, wet and dry milling of pulses. Oilseeds: processing of edible oilseeds-oil extraction and refining.

Unit 7: Fruit and Vegetable Processing

Maturity indices, ripening of climacteric and non-climacteric fruits, minimal processing of fruits and vegetables, Storage practices: Controlled atmosphere and Modified Atmosphere, hypobaric storage, pre-cooling and cold storage, Zero energy cool chamber, enzymes in fruit and vegetable processing, Technology of canning of fruits and vegetables, defects in canned foods, chemistry of pectin and its role in gel formation (theory of gel formation), processing technology for preparation of jams, jellies, marmalades, preserves, fruit juices, cordial, squash, RTS beverages, pickles, tomato juice, tomato ketchup, tomato puree, tomato paste, tomato sauce, plant pigments and effect of processing on chlorophyll, anthocyanin and carotenoids, Processing technology of tea, cocoa and coffee. Utilization of fruit and vegetable waste.

Unit 8: Technology of milk and milk products

Composition and nutritive value of milk, major and minor milk constituents, physico-chemical properties of milk, cooling and transportation of milk, Dairy plant operations- receiving, pre-heating, filtration/ clarification, standardization (Pearson's square method), pasteurization, UHT pasteurization, homogenization, sterilization. Special milks such as homogenized, flavoured, sterilized, recombined & reconstituted, toned & double toned milk. Condensed milk- Definition, methods of manufacture of condensed & evaporated milk; dried milk- Definition, methods of manufacture of skim & whole milk powder, instantization. Cream- Definition, classification, composition, cream separation, neutralization,

sterilization, pasteurization & cooling of cream, Butter- Definition, composition, methods of manufacture, defects in butter. Ice cream- Definition, nutritive value, methods of manufacture. Cheese: Definition, composition, classification, methods of manufacture of Cheddar cheese, curing process, cottage and processed cheese, defects in cheese.

Unit 9: Technology of meat/fish/poultry products

Miscroscopic structure of meat tissue, handling and ante-mortem inspection, stunning methods, slaughter-pithing and sticking, poultry processing, post-mortem changes in muscle and its conversion to meat, development of rigor mortis, resolution of rigor and tenderization of meat, mechanism of tenderization. Lean meat quality, pigments and changes in meat colour, curing, smoking, freezing and canning of meat, Composition and structure of fish, post mortem changes in fish, handling, freezing, and canning of fish, preparation of fish protein concentrate, fish oil and fish sausage, Structure, composition of eggs, egg proteins, factors affecting egg quality and evaluation of egg quality, preservation of eggs using coating, thermostabilization, and refrigeration.

Unit 10: Food Packaging and additives

Functions of packaging and packaging materials, Types of packaging materials: Paper: types of papers and their testing methods; Glass: composition, types of closures, methods of bottle making; Metals: Tinplate containers, tinning process, components of tinplate, tin free steel (TFS), types of cans, aluminum containers, lacquers; Plastics: types of plastic films, biodegradable plastics. Tetra packs- its structure and application in food processing. Barrier properties of packaging materials: gas transmission rate (GTR), water vapour transmission rate (WVTR), Active and intelligent packaging, Antimicrobial food packaging, biodegradable packaging. Nutritional labelling requirements of foods, Definition and classification of additives, natural and synthetic colorants used in foods, flavour enhancers and sweeteners used in foods.