



Syllabus for PhD (FT) in Food Process Technology

Entrance Examination- 2026

Unit 1: Chemistry and Microbiology

Carbohydrates, Lipids, Proteins and Minerals: Types, Characteristics, Structure and Functional Properties. Starch retrogradation, lipid oxidation, protein denaturation and aggregation. Maillard reaction, emulsification, foaming and Gelation. Amino acids and classifications. Fatty acids and classification. Hydrocolloids: properties and function- sources; application in food. Emulsifiers and Stabilizers. Food Microbiology: Microbial spoilage mechanisms in different food categories, pathogenic microorganisms, intrinsic and extrinsic factors detection and control.

Unit 2: Properties of Food Materials and Powders

Moisture-dependent properties: Moisture content, water activity, Angle of Repose, friction, drag coefficient, aerodynamic properties and hydrodynamic properties. Optical properties of food: Light transmittance, reflectance, and absorptance. Flow and deformation properties of foods - Principles of flow behavior and deformation of food systems. Viscosity and its measurement methods. Food powder properties - Particle size, shape morphology, bulk density, and cohesion. Compressibility under Vibration, tapping, Flow ability, caking, and anticaking agents. Mixtures and Segregation of powder, mixing and segregation Indices.

Unit 3: Processing of Foods

Structure, composition, milling and processing of different food grains like wheat, rice, maize, oat, pulses, millets and oil seeds. Anti-nutritional factors in food grains and oilseeds. Milling of food grains. Primary and secondary processing. Value-added food grain: Physiology of development, ripening and senescence of fruits and vegetables. Precooling and primary processing of fruits and vegetables. Minimal processing techniques. Enzymatic effects on flavour and texture of fresh-cut fruits and vegetables, and preservative treatments for fresh-cut fruits and vegetables. Raw milk - Cooling and transportation, Platform tests, Filtration and Clarification, Bactofugation, and storage. Milk - Standardization, Cream Separation, Homogenization, Pasteurization: HTST, LTLT. UHT Processing of milk, Packaging: pouch filling, bottle filling, and aseptic filling systems. Sources of Meat- Muscle structure and compositions; Factors influencing meat quality. Stunning and Slaughtering types. Types of Marine foods: fish, prawn, seaweed. Composition and nutritive value.



Unit 4: Advances in Food Processing

Classification of emerging technologies: thermal, non-thermal, and hybrid. Microwave, RF, IR processing, High Pressure Processing, SCFE, Pulsed Electric Fields (PEF), Cold Plasma Technology, Electro Magnetic Field and irradiation. Ultrafiltration, Reverse Osmosis, Evaporation, Freeze concentration. Drying techniques - Hybrid drying, Spray Freeze drying, Electro spray drying, Heat pump drying, Refractance window drying, and impingement drying. Freezing time estimation, Extrusion technology, and 3D/4D food printing.

Unit 5: New Food Product Development

Food innovation, New Food Product Development process and activities, Stage-Gate model NPD success factors, new product design, Sensory Evaluation, Discrimination test types and procedure - Difference tests (paired comparison, duo-trio, triangle tests), ranking test, scoring, hedonic scale. Product Stability: evaluation of shelf life; accelerated shelf-life determination; changes in sensory attributes and effects of environmental conditions. Probiotic, prebiotic, and symbiotic, and their functional roles. Standardisation & large-scale production. Nutrition Labelling.

Unit 6: Food ingredients and safety

Role of food ingredients and additives in food processing, functions, classification, intentional and non-intentional food additives, toxicology and safety evaluation of food additives, beneficial effects of food additives, food additives generally recognized as safe (GRAS), tolerance levels and toxic levels in foods-LD 50 values of food additives. Regulatory approvals (FSSAI, Codex, FDA, EFSA) and status for emerging technologies. Food Traceability - Food safety management systems (FSMS), ISO 9001 and 14001.

Unit 7: Statistics

Types of research: basic, applied, experimental, and analytical; Research process: problem identification, literature review, hypothesis formulation; Data types: qualitative, quantitative, nominal, ordinal, interval, ratio; Descriptive statistics: measures of central tendency and dispersion; types of errors; Parametric tests: t-test, ANOVA, MNOVA, post-hoc tests; non-parametric tests: Chi-square, Mann–Whitney U, Kruskal–Wallis; Correlation and regression analysis (simple and multiple). Experimental design: CRD, RBD, factorial design and Optimisation techniques.