



**Indian Institute of Food Processing Technology, Thanjavur**  
**Post Graduate Entrance Examination- 2020**  
*Ph.D. (Food Technology) in Food Process Technology syllabus*

**Unit 1: Food Chemistry and Nutrition**

Water relationships in foods: water activity and its relevance to deteriorative processes in foods (chemical, enzymic, physical and microbial changes). Interactions among food components and their effect on sensory, nutritional and processing quality. Therapeutic, Parenteral and Geriatric nutrition and relevant food formulations. Amino acids classification, physical properties, chemical reactions, synthesis of amino acids in food fortification. Fatty acids nomenclature and classification, physical properties and chemical reactions. Biosynthesis of unsaturated fatty acids.

**Unit 2: Food Product Development and Quality Evaluation**

New Food Product Development (NPD) process and activities, Stage-Gate model NPD success factors, new product design, food innovation case studies, market-oriented NPD methodologies, organization for successful NPD; Recipe development; Food needs and consumer preference - Market survey and its importance. Process design, equipment needed; establishing process parameters for optimum quality; Sensory Evaluation; Lab requirements; different techniques and tests; Quality, safety and regulatory aspects - Product Stability; evaluation of shelf life; changes in sensory attributes and effects of environmental conditions; accelerated shelf life determination;

**Unit 3: Fruits and Vegetable Processing**

Physiology of development, ripening and senescence of fruits and vegetables, Harvesting and harvesting indices of fruits and vegetables, postharvest changes of fruits and vegetables, precooling and primary processing of fruits and vegetables. Minimal processing techniques. Enzymatic effects on flavor and texture of fresh-cut fruits and vegetables, preservative treatments for fresh-cut fruits and vegetables. Edible coatings, gas permeation properties of edible coatings, wettability and coating effectiveness. Utilization of by-products from fruits and vegetables processing industries. Valorisation of fruits and vegetable industries waste for developing active biomolecules.

**Unit 4: Processing of Milk, Meat, Poultry and Marine Products**

Present status of value added products from milk - method of manufacture – indigenous milk products - Whey powder, protein concentrate and isolate; Hygiene in milk product manufacture, assessment of hygiene requirements, CIP, HACCP outline, Testing of Milk and Milk Products, Treatment of Dairy Wastes. Current trends and prospects of meat industry - Abattoir Layout, designing - equipment, operation and maintenance of slaughter houses and processing plants - hygiene and sanitary conditions in meat processing plant-pre slaughter judging, inspection, grading of animals. Utilization of byproducts and wastes from meat. Advances in poultry dressing, meat yield, preservation, microbiology and quality control methods. standards and marketing of egg and egg products- preservation and maintenance of quality of eggs - spoilage of egg and its prevention packaging of egg and egg products. preservation of postharvest fish freshness; transportation in refrigerated vehicles;

deodorization of transport systems; grading and preservation of shell fish; pickling and preparation of fish protein concentrate, fish oil and other by products.

### **Unit 5: Functional Foods and Nutraceuticals**

Properties and functions of various nutraceuticals – functional food ingredients – protein, complex carbohydrate like dietary fibre as functional food ingredient – probiotic, prebiotic and symbiotic and their functional role. Concept of free radicals and antioxidants; antioxidants role as nutraceuticals and functional foods. ultra violet spectroscopy; infrared absorption spectroscopy; near-infrared absorption spectroscopy; mass spectroscopy; nuclear magnetic resonance spectroscopy; CHN analysis; x-ray crystallography Anti-nutritional factors present in foods - types of inhibitors present in various foods and their inactivation.

### **Unit 6: Food Packaging**

Active and intelligent packaging - Oxygen, ethylene and other scavengers - Constructing an antimicrobial packaging system, Factors affecting the effectiveness of antimicrobial packaging - Non-migratory bioactive polymers (NMBP) in food packaging - Time-temperature indicators (TTIs) - Packaging-flavour interactions, Factors affecting flavour absorption, role of the food matrix, role of differing packaging materials - Novel MAP gases, Testing novel MAP applications - biodegradable packaging materials, emerging trends in packaging, food marketing and role of packaging.

### **Unit 7: Food Biotechnology**

Chemical nature of the genetic material, properties, structure and functions of the genetic material - Plasmids, types of plasmids, genetic recombination in bacteria, transformation, transduction, conjugation, regulation of gene expression in prokaryotes; - Design of PCR primers, RT-PCR, qRT-PCR - Immobilization of enzymes; types of immobilized cell systems, large scale cell immobilization, uses and applications in industries - Testing for GMOs, current guidelines for production, release and movement of GMOs, labeling and traceability, trade related aspects, bio-safety, risk assessment, risk management, public perception of GM foods, IPR, GMO Act 2004.

### **Unit 8: Food Microbiology**

Foods as ecological niches, Relevant microbial groups, Microbes found in raw materials and foods that are detrimental to quality, Factors that influence the development of microbes in food, newer and rapid methods for qualitative and quantitative assay demonstrating the presence and characterization of microbes, Stress, damage, adaptation, reparation, death. Microbial growth in food: intrinsic, extrinsic and implicit factors, Microbial interactions, Inorganic, organic and antibiotic additives. Effects of enzymes and other proteins, Combination systems, Adaptation phenomena and stress phenomena, Effect of injury on growth or survival, Commercial available databases. Microbial behaviour against the newer methods of food processing, Adoption and resistance development, Microbes as test organisms, as sensors and as tools for future applications in energy production and food and non food industrial products. Modern methods of cell culture: synchronous and co- cell culture, continuous cell culture in liquid and solid media, Cell immobilization and applications, Pre and probiotics cultures.

## **Unit 9: Emerging Trends in Food Process Technology**

Novel Thermal Techniques, dielectric heating Microwave processing - RF- heating, equipment, processing and effect on microorganisms, IR heating, Electrical resistance heating of food - heat generation - ohmic heater, heating models - principles and application - influence on microorganisms and food ingredients - Ultra filtration, Reverse Osmosis, Evaporation, Freeze concentration, drying techniques Hybrid drying, Spray Freeze drying, electro spray drying, Heat pump drying, Refractance window drying, Impingement drying - Freezing time estimation - High pressure processing of food - Ultrasound application—mechanism of inactivation of microorganisms and enzymes - Oscillating Magnetic Fields - Ozone for inactivation - Factors affecting efficacy of ozone Processing-Cold plasma concepts - microbial inactivation-quality of products-safety. UV light and pulsed light preservation - microbial inactivation mechanism. Pulsed Electric Field - Principles of operation - Equipment - processing - control parameters - Irradiation technologies - general mode of action - Equipment and operational parameters - ionizing radiation- dosimetry - lethal effects on microorganisms.

## **Unit 10: Statistical methods for food science & technology**

Descriptive statistics, Mean, variance, probability, conditional probability, Probability distribution. Density functions, Mean variance. Data and its nature; data representation; diagrams and graphs using MS Excel, Measures of Central tendency; Dispersion, Skewness and Kurtosis; Binomial and Normal Distributions. Confidence Interval of mean; Test of significance; Non-parametric tests; Simple, Partial and Multiple correlations. Estimation, confidence intervals hypothesis testing, Basic principles of Experimental Designs; Analysis of Variance; Elements of Quality Control.