



## **Syllabus for PhD (FT) in Food Safety and Quality Assurance**

### **Entrance Examination- 2026**

#### **Unit I: Principles of Food Safety**

Food Sanitation and safety: Factors contributing to physical, chemical and biological contamination in food chain, prevention and control of food borne hazards, definition and regulation of food sanitation, sources of contamination, personal hygiene-food handlers, cleaning compounds, sanitation methods, waste disposal strategy (solid and liquid waste) and pest control. Food adulteration: common adulterants, simple tests for detection of adulteration. Food additives- classification, functional role and safety issues.

#### **Unit II: Food Chemistry**

Carbohydrates: structure and functional properties of mono-, oligo-, & poly-saccharides including starch, cellulose, pectic substances and dietary fibre, gelatinization and retrogradation of starch. Proteins: classification and structure of proteins in food, Lipids: classification and structure of lipids, rancidity, polymerization and polymorphism. Pigments: carotenoids, chlorophylls, anthocyanins, tannins and myoglobin. Food flavours: terpenes, esters, aldehydes, ketones and quinines. Enzymes: specificity, simple and inhibition kinetics, coenzymes, enzymatic and non-enzymatic browning. Nutrition: balanced diet, essential amino acids and essential fatty acids, protein efficiency ratio, water soluble and fat soluble vitamins, role of minerals in nutrition, co-factors, anti-nutrients, nutraceuticals, Chemical and biochemical changes during processing and storage

#### **Unit III: Analytical Techniques for Food Quality**

Analytical method used for quality determination: chemical and physical, microbiological, biochemical and sensory analysis. Analytical methods of determination of basic food components: protein, saccharides, lipids, vitamins, water, minerals and trace elements, sensory active compounds, anti-nutritive and natural toxic compounds, food additives and food contaminants. Basic principles of chromatography. Paper Chromatography. Spectrophotometric techniques: Spectrophotometry introduction and principles.



#### **Unit IV: Food Microbiology**

Characteristics of microorganisms: morphology of bacteria, yeast and mold, spores and vegetative cells, Gram-staining. Microbial growth: growth and death kinetics, serial dilution technique. Food spoilage: spoilage microorganisms in different food products including fruit & vegetable, milk, fish, meat, egg, cereals and their products. Toxins from microbes - mycotoxins: pathogens and non-pathogens including Staphylococcus, Salmonella, Shigella, Escherichia, Bacillus, Clostridium, and Aspergillus genera. Fermented foods and beverages: curd, yoghurt, cheese, pickles, soya-sauce, sauerkraut, idli, dosa, vinegar, alcoholic beverages and sausage. Thermal death time and process time calculations.

#### **Unit V: Food Laws and Regulations**

Food Safety Systems: Quality systems standards including ISO; Auditing; Good Manufacturing Practice and HACCP. Food Laws & Implementing Agencies-National: FSSAI. International Scenario in Food Regulation USFDA, EFSA, UK, Canada, A & NZ, Japan, Malaysia, Singapore; Consumer Movements; Intellectual Property Rights and Trade Marks: Protection of investment and efforts in research and development by patenting; Criteria of patentability; National and international patent; Terms of patents; Copyright. International Agencies in Food Regulation: Food Codex Alimentarius: Various aspects and relation with domestic laws; FAO, WHO, WTO.

#### **Unit VI: Food Science and Technology**

Basics of food science and technology. Methods of food preservation such as heat processing, pasteurization, canning, dehydration, freezing, freeze drying, fermentation, microwave, irradiation and chemical additives. Refrigerated, modified and controlled atmospheric storage. Aseptic preservation, hurdle technology. non-thermal technologies, alternate-thermal technologies. Intermediate moisture food products, low acid foods, high acid foods and shelf stable foods. Socio-cultural, psychological and economical consideration for food appearance, domestic and export marketing. Consumer trends and their impact on new product development. Product development *viz.* to conceive ideas, evaluation of ideas, developing ideas into products, test marketing and commercialization. Role of food in human nutrition. Nutritional disorders, natural contaminants and health hazards associated with foods. Diet therapy, probiotic and prebiotic foods Therapeutic, organic foods, designer foods, nutrigenomics, nutraceutical and functional foods.



### **Unit VII: Preservation of Fruits and Vegetables**

Extraction, clarification, concentration and packaging of fruit juice, jam, jelly, marmalade, squash, candies, tomato sauce, ketchup, and puree, chips, pickles - equipments used. Minimally processing of fruit and vegetables. Dehydrated fruits and vegetables. Technology of Preservation by sugar, salt, chemical. Fermented foods and beverages from fruit and vegetables. Aerated drinks, frozen fruits and vegetables, IQF products. By-products utilization of fruits and vegetable processing industry.

### **Unit VIII: Processing of Food Grains and Spices**

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 food grains. Milling and parboiling of rice. Products and by-products of rice milling and their utilization. Oil seed processing: expelling, solvent extraction, refining and hydrogenation. Spices and plantation crops processing - Post harvest processing of major and minor spices.

### **Unit IX: Technology of Dairy/Meat / Fish / Poultry Products**

Milk composition, Physical and chemical properties of milk. Toned, double toned, standardized, UHT, fortified, reconstituted and flavored milks. Technology of fermented milks. Milk products processing viz. cream, butter, ghee, cheese, condensed milk, evaporated milk, whole and skimmed milk powder, ice cream, khoa, channa, paneer and similar products. Judging and grading of milk products. Chemistry, Nutritional value and microscopic structure of meat tissue. Ante mortem inspection, principle and methods of slaughtering of various animals and poultry birds, Postmortem examination and Rigor mortis. Retail and wholesale cuts. Factors affecting meat quality. Structure and composition of egg, factors affecting egg quality. Quality measurement of egg. Preservation methods of shell eggs and egg products freezing- pasteurization- desugarisation.



### **Unit X: Food Packaging and Labelling**

Packaging terminologies. Functions of food packaging. Packaging requirements for different environments. Basis for selection of packaging material. Packaging materials *viz.* properties and testing procedures, packaging technologies for perishables and highly perishables' fresh and processed foods Packaging technologies for. Shelf-life studies. Recent trends in packaging, aseptic, active packaging, smart packaging, intelligent packaging, modified atmosphere, vacuum and gas packaging. Food labelling requirements.