

**Syllabus  
for  
Food Engineering and Technology  
(MTQP06)**

**Note:**

- i. *The Question Paper will have 75 questions.*
- ii. *All questions will be based on Subject-Specific Knowledge.*
- iii. *All questions are compulsory.*
- iv. *The Question paper will be in English.*

## **Food Engineering and Technology (MTQP06)**

### **Section 1: Food Chemistry and Nutrition**

**Carbohydrates:** Structure and functional properties of mono-, oligo-, & poly- saccharides including starch, cellulose, pectic substances and dietary fiber, gelatinization and retro gradation of starch.

**Proteins:** Classification and structure of proteins in food, biochemical changes in postmortem and tenderization of muscles.

**Lipids:** Classification and structure of lipids, rancidity, polymerization and polymorphism.

**Pigments:** Carotenoids, chlorophylls, anthocyanins, tannins and myoglobin.

**Food flavors:** 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, nutrient deficiency diseases.

**Chemical and biochemical changes:** Changes occur in foods during different processing.

### **Section 2: Food Microbiology**

**Characteristics of microorganisms:** Morphology of bacteria, yeast, mold and actinomycetes, spores and vegetative cells, gram-staining. Microbial growth: growth and death kinetics, serial dilution technique.

**Food spoilage:** Spoilage microorganisms in different food products including milk, fish, meat, egg, cereals and their products.

**Toxins from microbes:** 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.

### **Section 3: Food Products Technology**

**Processing principles:** Thermal processing, chilling, freezing, dehydration, addition of preservatives and food additives, irradiation, fermentation, hurdle technology, intermediate moisture foods.

**Food packaging and storage:** Packaging materials, aseptic packaging, controlled and modified atmosphere storage.

**Cereal processing and products:** Milling of rice, wheat, and maize, parboiling of paddy, bread, biscuits, extruded products and ready to eat breakfast cereals.

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**Oil processing:** Expelling, solvent extraction, refining and hydrogenation.

**Fruits and vegetables processing:** extraction, clarification, concentration and packaging of fruit juice, jam, jelly, marmalade, squash, candies, tomato sauce, ketchup, and puree, potato chips, pickles.

Plantation crops processing and products: tea, coffee, cocoa, spice, extraction of essential oils and oleoresins from spices.

**Milk and milk products processing:** Pasteurization and sterilization, cream, butter, ghee, ice- cream, cheese and milk powder.

**Processing of animal products:** Drying, canning, and freezing of fish and meat; production of egg powder.

**Waste utilization:** Pectin from fruit wastes, uses of by-products from rice milling.

**Food standards and quality maintenance:** FPO, PFA, Agmark, ISI, HACCP, food plant sanitation and cleaning in place (CIP)

### Section 4: Food Engineering

**Mass and energy balance; Momentum transfer:** Flow rate and pressure drop relationships for Newtonian fluids flowing through pipe, Reynolds number.

**Heat transfer:** Heat transfer by conduction, convection, radiation, heat exchangers.

**Mass transfer:** Molecular diffusion and Fick's law, conduction and convective mass transfer, permeability through single and multilayer films.

**Mechanical operations:** Size reduction of solids, high pressure homogenization, filtration, centrifugation, settling, sieving, mixing & agitation of liquid.

**Thermal operations:** Thermal sterilization, evaporation of liquid foods, hot air drying of solids, spray and freeze-drying, freezing and crystallization.

**Mass transfer operations:** Psychometry, humidification and dehumidification operations.