

# UNIVERSITY OF MYSORE

## Syllabus for Ph.D. Entrance Exam Food Science / Food technology

### Unit 1: Chemistry of Foods

Introduction to chemistry of foods: composition and factors affecting the composition of foods, Moisture in foods and methods of moisture determination, minerals in foods; Carbohydrates: monosaccharides, disaccharides and trisaccharides, their occurrence and classification; isomerism in hexoses, principles of structure determination; Chemistry of cellulose, starches and other polysaccharides; Chemistry of amino acids and proteins; classification of proteins, chemical and physical properties of proteins, structure of proteins and techniques used in elucidation of protein structure; Oils and fats: chemistry, occurrence, classification and composition; Vitamins: Chemistry and changes during processing; Essential oils: Chemistry, occurrence and extraction; Terpeneless oils and their use in foods;

### Unit 2: Basics of Food Microbiology

Historical development of Microbiology, Morphology, general cytology and reproduction of bacteria, yeast, fungi, actinomycetes and algae; Genetic recombination, transformation, transduction, bacterial conjugation, mutation and mutagenesis; Physiology of microorganisms; Growth and destruction of microorganisms, growth curves and methods of measuring microbial growth; Physical, chemical and biological factors influencing the destruction of microorganisms including concepts of Z, F and D values; Bacterial foodborne infections & intoxications; Mycotoxins

### Unit 3: Biochemistry

Relevance of biochemistry in food science and technology; Cell structure, separation of sub-cellular components and their biochemical functions; Enzymes, general properties, classification of enzymes, coenzymes and co-factors and kinetics of enzymes; enzyme inhibition and kinetics of enzyme inhibition; purification of enzymes, allosteric enzymes and enzyme regulation; Carbohydrate metabolism, glycolysis, Krebs's Cycle, hexose monophosphate shunt, oxidative phosphorylation; biosynthesis and breakdown of starch and glycogen; Protein metabolism; mechanism of amino acid metabolism; deamination, transamination, decarboxylation and amino acid oxidation; Nucleic acids, structure of DNA and RNA; Elements of immunology; Biochemistry of hormones

### Unit 4: Basics of Nutrition

Energy value of foods and energy requirement; Nutritional aspects of proteins, quality of proteins, protein requirement and protein deficiency diseases; Nutritional aspects of fats, essential fatty acids and their role in the body; Nutritional aspects of carbohydrates; Role of dietary fibre; Nutritional significance of vitamins & minerals and related deficiency diseases; Recommended Daily Allowances for nutrients and balanced diets; Nutritional requirement in diabetes, atherosclerosis and obesity; Athletic and therapeutic foods

### Unit 5: Industrial Microbiology

Microbial production of substances of food applications such as amino acids, enzymes, food flavours and potentiators, organic acids; Production of fats, proteins, polysaccharides and vitamins by microbial processes (algae & yeast); Fermented foods and beverages; Types of fermentation processes and their advantages and disadvantages; Kinetics of microbial growth and death; Bioreactors for microbial, plant and animal cell cultures; Batch, fed batch and continuous bioreactors and their design

and analysis; Downstream processing of biological materials; Immobilized Enzyme Technology; Effluent treatment

#### Unit 6: Principles of Food Processing

**Basic** principles of food processing, thermal processing, canning, rigid tin plates and cans, aluminum cans, heat penetration into containers, pH classification of foods, heat resistance of microorganism, heat resistance of enzymes in foods, methods for determination of process time, inoculated pack studies, spoilage of thermally processed food, composite can, fabrication, specification, corrosion of cans; **Flexible** packaging materials, types, properties, application and selection for specific food products; **Refrigerated** storage, effect of low temperature on fresh food commodities and prepared products; Modified and controlled atmosphere storage and gas storage; **Preservation** by freezing, freezing points of foods, slow and quick freezing, cryogenic freezing and frozen food storage; **Drying** and dehydration, sun drying, solar dehydration, mechanical drying, types of dryers; **Food** fermentations: Alcoholic, acetic and lactic fermentation, traditional and new products, pickling and curing, role of salt in food preservation, types of salt and cured products; **Preservation** by controlling water activity, high sugar products, intermediate moisture foods, liquid food concentrates, role of water activity in food preservation; **Food** irradiation, principle, type and source of radiation, radiation effect on food constituents and food regulations; **Primary** processing of foods, milling of wheat, rice, coarse grains and pulses; **Oil** seeds processing, processing of spices and plantation products; **Hurdle** technology, Principles, applications and advantages; **Effect** of storage and processing on food quality

#### Unit 7: General Engineering

**Units**, dimensions and conversions, SI system; **Material** and energy balances, simple calculation/estimation of energy requirement in pasteurization, evaporation and dehydration operations; **Properties** of steam and moist air; steam tables and psychrometric charts (for drying); **Boilers** and their rating, boiler hp, fire and water tube boilers, package boilers, mountings and accessories; Steam distribution, pipes, valves fittings and insulation. pressure losses, pressure reduction, condensate return and culinary steam; **Materials** for food plant construction - MS, SS and plastics; corrosion in metals; **Voltage**, current and resistance, units, relations and Ohm's Law. AC single phase, three phase systems, concepts of phase difference, power factor, inductance, capacitance and impedance; Relationships KW and KVA, AC motors - single and three phase, starters and types of starters

#### Unit 8: Food Engineering

**Properties** of solid food materials - shape, density, porosity and others; **Angles** of friction/repose, relations and simple calculations; **Pressure** drops and pressure, head and energy relationships; **Flow** properties of liquid foods, pulps and slurries; **Viscosity**, consistency, simple rheological models; **Heat** transfer, conduction, convection and radiation with examples; steady and unsteady heat transfer, overall heat transfer coefficient and its significance, heat exchange equipment, types, relative merits and demerits; **Radiation** heating; Infra red and solar heating - principles, applications and equipment; **Freezing** and thawing, principles, applications and equipment; **Evaporation**: classification and uses of evaporators, multiple effect evaporation, vapour recompression, basic calculations; **Extraction** and leaching: principles, equipment, types and applications; **Mass** and momentum transfer operations: theory and applications in food processing; **Distillation**: principles, equipment and applications, steam distillation and molecular distillation; **Drying**: theory of drying, types of driers and their applications