AMFT22 FOOD PROCESS ENGINEERING AND ECONOMICS

UNIT-1 RHEOLOGY AND TEXTURE OF FOOD MATERIALS
1.1 Concept of rheology, elastic, plastic and viscous behavior, viscoelasticity, rheological models and constitutive equations.
1.2 Methods of texture evaluation, subjective and objective measurements.
1.3 Aerodynamic and hydrodynamic characteristics. Application to separation, pneumatic handling and conveying.
1.4 Material handling: Material handling machines and conveyors.
1.5 Pre-treatment unit operations: Cleaning, Dehullingand Dehusking, Sorting & Grading, Peeling, Mixing and Forming. Size reduction and separation.
1.6 Agitation and Mixing. Mechanical Separations: Centrifugation, liquid-liquid centrifugation, liquid solid centrifugation, clarifiers, desludging and decanting machines.
1.7 Filtration: Principles involved in filtration. Pressure and vacuum filtration.
1.8 Expression: batch and continuous type. Extraction and Leaching, Crystallization and Distillation: Basic principles involved. Baking, Roasting and Frying equipment

UNIT-2 THERMAL PROCESSING
2.1 Concept of thermos bacteriology: Arrhenius analogy, its application in design.
2.2 Determination of heat resistance of microorganisms.
2.3 Thermal processing: Blanching, Pasteurizations and Sterilization- principles, different methods and equipments.
2.4 Processing in containers, process time, Tevaluation, Design of batch and continuous sterilization. Design and analysis of fermenter.
2.5 Shelf life: Calculation of shelf life. Shelf life requirements, Deteriorative reactions. Accelerated testing. Transport properties of barriers.
2.6 Simulations of product- package environment interaction. Shelf life simulation for moisture, oxygen, and light sensitive products.

UNIT-3 WATER BINDING AND DRYING
3.1 Raults Law. Water sorption Isotherms - Hysteresis. Water activity measurement method.
3.2 Water binding and its effect on enzymatic and non enzymatic reactions and food texture.
3.3 Control of water activity and moisture.
3.4 Permeability: Theoretical considerations. Permeability of gases and vapours. Permeability of multilayer materials.
3.5 Permeability in relation to packaging requirement of foods.
3.6 Drying: Principles of drying, drying rate kinetics, Classification, mass and energy balance.
3.7 Different types of dryers and components - roller, spray, tray, compartment, fluidized bed etc.

UNIT-4 METHODS OF FOOD PROCESSING
4.1 Low Temperature: Freezing of Foods, Types of freezers including, ice cream freezers, Freeze concentration and freeze drying.

4.2 Freezing curves, phase diagrams, methods of freeze concentration, design problems.

4.3 Membrane processes: Ultra filtration, Reverse osmosis, Electrodialysis, per-evaporation and micro filtration.

4.4 High Temperature: Extrusion: Extrusion cookers, cold extrusion, single and twin screw extrusion. Low pressure and high pressure extrusion, properties of Food materials, its significance in equipment design,

4.5 Processing and handling Evaporation: Principles of evaporation, types and selection evaporators, mass and energy balance.

4.6 Design of single and multiple effect evaporators, recompression heat and mass recovery and vacuum creating devices.

4.7 Fouling of evaporators and heat exchanges.

4.8 Non – Thermal Methods: Microwave and Dielectric & Infrared heating: Physical parameters.

4.9 Heat transfer phenomenon. Equipment and application. Irradiation - Principle and its equipments, Blending and pulverization equipments.

UNIT-5 LAYOUT AND COST ESTIMATION

5.1 Technology scale up- Product and process layout- Expansion and Improvements of Existing Facilities

5.2 Inventory control- Cost Indexes - Capacity vis-a-vis Costs- Factored Cost Estimate

5.3 Break- even point- Improvements- Module Cost Estimation- Unit Operations Estimate

5.4 Detailed Cost Estimate- Accuracy of Estimates- .

References Books

1 Sahay, K. M. and K.K.Singh..."Unit operation of Agricultural Processing", Vikas Publishing House Pvt. Ltd., New Delhi, 2004

2 Berk, Zeki. "Food Process Engineering and Technology". Elsevier, 2009.