

Department of Agricultural Process Engineering

APE 355 **Dairy and Food Engineering** 2 + 1 = 3

Unit operation of various dairy and food processing systems. Engineering, thermal and chemical properties of milk and milk products. Process flow charts for product manufacture. Material and energy balances. Working principles of equipments for receiving, pasteurization, sterilization, homogenisation, filling & packaging. Dairy plant design and layout. Composition and proximate analysis of food products. Deterioration in products and their controls. Physical, chemical and biological methods of food preservation, changes undergone by the food components during processing, evaporation, drying, freezing juice extraction, filtration, membrane separation, thermal processing. Food packaging. Plant utilities requirement.

Practical

Study of a composite pilot milk processing plant & equipments; Study of pasteurisers; Study of sterilizers; Study of homogenisers; Study of separators; Study of butter churners; Study of evaporators; Study of milk dryers; Study of freezers; Design of food processing plants & preparation of layout; Visit to multi-product dairy plant; Determination of physical properties of food products; Estimation of steam requirements; Visit to Food industry.

APE 356 **Drying of Farm crops** 1+1=2

Theory-

Moisture content and methods for determination. Importance of EMC and methods of its determination, EMC curve and EMC model. Principle of drying. Theory of diffusion, Mechanism of drying - falling rate, constant rate, thin layer, deep bed and their analysis, Critical moisture content. Drying models, calculation of drying air temperature and air flow rate. Air pressure within the grain bed, Shedd's and Hukill's equation. Different methods of drying including puff drying, foam mat drying, freeze drying, etc. Study of different types of dryers- performance, energy utilization pattern and efficiency. Study of drying and dehydration of agricultural products.

Practical

Measurement of moisture content during drying and aeration; Measurement of relative humidity during drying and aeration using different techniques; Measurement of air velocity during drying and aeration; Drying characteristic and determination of drying constant; Determination of EMC and ERH; Study of various types of dryers. Visit to food drying industries.

APE 357 **Storage Engineering** 1+1=2

Theory-

Types and causes of spoilage in storage. Conditions for storage of perishable products, Functional requirements of storage. Air movement inside the storage, Storage of grains. Destructive agents, Respiration of grains, Moisture and temperature changes in stored grains. Conditioning of environment inside storage through natural ventilation, mechanical ventilation. Artificial drying, Grain storage structures including Silo, CAP, Warehouse. Storage of grains and their products, Storage of seeds, hermetically sealed and air-cooled storages-refrigerated. Control of temperature and relative humidities inside storage. Modified atmospheric storage and Control of its environment, Controlled atmosphere. modified atmospheric and frozen storages. Storage condition for various fruits and vegetables under cold and CA storage system. Economic aspects of storage.

Practical

To study the effect of relative humidity and temperature on grains stored in gunny bags and bins; Design and layout of commercial bag storage facilities; Design and layout of commercial bulk storage facilities; Study of different domestic storage structures; Visits to commercial handling and storage facilities for grains.