

# **Dairy and Food Engineering 3(2+1)**

## **Theory**

Deterioration in food products and their controls, Physical, chemical and biological methods of food preservation. Nanotechnology: History, fundamental concepts, tools and techniques nanomaterials, applications in food packaging and products, implications, environmental impact of nanomaterials and their potential effects on global economics, regulation of nanotechnology. Dairy development in India, Engineering, thermal and chemical properties of milk and milk products, Process flow charts for product manufacture, Unit operation of various dairy and food processing systems. Principles and equipment related to receiving of milk, pasteurization, sterilization, homogenization, centrifugation and cream separation. Preparation methods and equipment for manufacture of cheese, paneer, butter and ice cream, Filling and packaging of milk and milk products; Dairy plant design and layout, Plant utilities; Principles of operation and equipment for thermal processing, Canning, Aseptic processing, Evaporation of food products: principle, types of evaporators, steam economy, multiple effect evaporation, vapour recompression, Drying of liquid and perishable foods: principles of drying, spray drying, drum drying, freeze drying, Filtration: principle, types of filters; Membrane separation, RO, Nano-filtration, Ultra filtration and Macro-filtration, equipment and applications, Non-thermal and other alternate thermal processing in Food processing.

## **Practical**

Study of pasteurizers, Study of sterilizers, Study of homogenizers, Study of separators, Study of butter churns, Study of evaporators, Study of milk dryers, Study of freezers, Study of filtration, Design of food processing plants & preparation of layout, Visit to multi-product dairy plant, Estimation of steam requirements, Estimation of refrigeration requirements in dairy & food plant, Visit to Food industry.

## **Suggested Readings**

- y Ahmed, T. 1997. Dairy Plant Engineering and Management. 4th Ed. Kitab Mahal.
- y McCabe, W.L. and Smith, J. C. 1999. Unit Operations of Chemical Engineering. McGraw Hill.
- y Rao, D.G. Fundamentals of Food Engineering. PHI learning Pvt. Ltd. New Delhi.
- y Singh, R.P. & Heldman, D.R. 1993. Introduction to Food Engineering. Academic Press.
- y Toledo, R. T. 1997. Fundamentals of Food Process Engineering. CBS Publisher.