

22PAFE304 DAIRY AND FOOD ENGINEERING

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of milk composition and properties of milk and thermal operation involved in food processing industry.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to evaluate performance of different thermal operations involved in dairy industry based on milk composition and properties. It also helps us to examine different mechanical operation and develop equipment. It illustrates about benefits of minimal processing and application of same in food industry over primitive process.

MODULE-1

UNIT-1

4L+8T+8P=20 Hours

PROPERTIES OF MILK & UNIT OPERATIONS:

Dairy development in India. Milk and its composition. Properties of milk and milk composition. Engineering, thermal and chemical properties of milk and milk products, Unit operation of various dairy and food processing systems. Principles and equipment related to receiving of milk. Pasteurization, sterilization, homogenization, centrifugation and cream separation. Deterioration in food products and their controls, Physical, chemical and biological methods of food preservation.

UNIT-2

4L+8T+8P=20 Hours

PERFORMANCE EVALUATION OF DAIRY EQUIPMENT:

Process flow charts for product manufacture, Pasteurization, sterilization, homogenization, centrifugation and cream separation – Classification and different equipments and performance evaluation. 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.

PRACTICES:

- Study of pasteurizers.
- Study of sterilizers.
- Study of homogenizers.
- Study of cream separators.
- Study of butter churns.
- Design of food processing plants & preparation of layout.
- Estimation of steam requirements.
- Estimation of refrigeration requirements in dairy & food plant.

MODULE-2

UNIT-1

4L+8T+8P=20 Hours

MECHANICAL AND THERMAL OPERATIONS: Principles of operation and equipment for thermal processing. Evaporation of food products – principle. Drying of liquid and perishable foods: principles of drying. Filtration: principle, types of filters; Membrane separation, RO, Nano-filtration, Ultra filtration and Macro-filtration, equipment and applications.



Source:
<https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcTgv9QL06PgpQyGOrAXop7GE2AJ4qCjm0SnYn7wu4NZxfA8WADrFg>

SKILLS:

- ✓ Compute different processing parameters required to develop dairy produc.
- ✓ Evaluate performance of dairy equipment involved and design a small dairy plant.
- ✓ Examine operations of different filtration techniques.
- ✓ Investigate problems caused due to thermal processing of food product and determine application of novel technologies.

UNIT-2**4L+8T+8P=20 Hours**

PERFORMANCE EVALUATION OF OPERATIONS: Canning, Aseptic processing, types of evaporators, steam economy, multiple effect evaporation, vapour recompression. Spray drying, drum drying, freeze drying. Non-thermal and other alternate thermal processing in Food processing. 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.

PRACTICES:

- Study of evaporators.
- Study of milk dryers.
- Study of freezers.
- Study of filtration.
- Visit to multi-product dairy plant.
- Visit to Food industry.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Illustrate different milk processing unit operations on the concept of physico chemical property of milk.	Apply	1	1, 2, 7
2	Analyze knowledge of milk processing and acquired knowledge to design several equipments in dairy industry.	Analyze	1	1, 2, 3, 4, 6, 9
3	Examine problems which rises during thermal processing and also determine remedies by designing aseptic or minimal processing.	Evaluate	2	1, 2, 6, 7, 9
4	Propose application of novel technologies in food industry over thermal or mechanical processing.	Evaluate	2	1, 2, 3, 4, 7, 9, 11
5	Design filtration equipment used in food processing industry.	Create	2	1, 2, 3, 4, 6, 7, 9, 11

TEXT BOOKS:

1. Sukumar De. "Outlines of Dairy Technology" 45th Ed. Oxford University Press, 1991.
2. Walstra, P., Wouters, T.M. & Geurts, T.J. "Dairy Science and Technology" Taylor & Francis, 2006.
3. Toledo, R. T. "Fundamentals of Food Process Engineering" CBS Publisher, 1997.

REFERENCE BOOKS:

1. Ahmed, T. "Dairy Plant Engineering and Management" 4th Ed. Kitab Mahal, 1997.
2. McCabe, W.L. and Smith, J. C. "Unit Operations of Chemical Engineering" McGraw Hill.
- Rao, D.G. Fundamentals of Food Engineering. PHI learning Pvt. Ltd. New Delhi, 1999.