

6th Semester		Dairy & Food Engineering	L-T-P 3-0-0	3 CREDITS
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Module I

(8 Hours)

Introduction, dairy development in India; Deterioration in food products, major spoilage agents, physical, chemical and biological methods of food preservation; Different constituents of milk, factors affecting composition of milk, acidity, pH, density and specific gravity, lactometer, total solids and SNF, freezing point, boiling point; Changes of milk due to boiling, expansion of milk, viscosity, surface tension, flavor, colour, fouling of milk, effect of metals on milk, selection of metals for dairy industry; Unit operations in various dairy and food processing systems; Process flow charts for product manufacture: Pasteurized and sterilized milk, butter, yogurt, cheese, flavoured milk, ice cream;

Module II

(8 Hours)

Working principles of equipment for receiving: Milk reception in cans, receiving of bulk milk, milk transport tanks, important considerations during unloading of milk transport tanks, milk storage tanks, storage tank accessories, milk silos; Pasteurization: difference between pasteurization, serialization and blanching, Long hold batch type pasteurization, its advantages and disadvantages; HTST method- flow chart, advantages and disadvantages, important accessories and controls in HTST pasteurization systems; Sterilization: difference between conventional serialization and aseptic processing, In-bottle serialization, Hydrostatic retort, Continuous rotary retort, UHT processing flow chart and system controls, Fouling in UHT systems and its control; Homogenization: advantages of homogenization, different forms of fat globules, homogenization principle and method, homogeniser and its parts, factors influencing homogenization; Centrifugation: major processes for separation of food, principle of centrifugation, classification of centrifuges, brief description of tubular bowl centrifuge and disk bowl centrifuge

Module III

(8 Hours)

Butter manufacture: principal constituents of butter, unit operations in butter making and importance of ripening, ageing, churning, etc. in the butter making process; Butter churns, continuous flotation churns, butter yield calculations; Preparation methods and equipment for cheese, paneer and ice cream; Filling and packaging: factors causing deterioration during milk storage, different types of packaging materials for milk and products, brief descriptions about the filling and metering of liquids and pastes, filling by gravity flow, FFS system; Piston type filling system, filling of pasty products, metering and filling of dry materials, aseptic filling of pouches, and aseptic filling of blow moulded plastic bottles.

Module IV

(8 Hours)

Dairy plant design and layout, plant utilities; Evaporation: objectives of evaporation, basic components of evaporators, different types of evaporators; Steam economy, multiple effect evaporation, vapor re-compression; Mass and energy balance in evaporation; Thermal processing: Thermal death time, D and z value, Process time calculations; Thermal processing equipment including the complete canning process; Drying of liquid and perishable foods: principles of drying, tray dryer, kiln dryer, fluidised bed dryer, freeze drying; Principle and components of spray drying, drum drying, freeze drying.

Module V

(8 Hours)

Filtration: principle, types of filters and their working principles; Classification of filters, plate and frame filter press, shell and leaf filter, rotary drum filter, filtering centrifuges, bag filter; Membrane separation, RO, Nona-filtration, Ultra filtration and Macro-filtration; Membrane separation equipment and applications; Non-thermal and other alternate thermal processing in food processing; high pressure processing; Nanotechnology: fundamental concepts, nanomaterials, tools and techniques; Applications in food packaging and products; implications, environmental impact of nanomaterials and their potential effects on global economics, regulation of nanotechnology.

Text Books

1. Ahmed, T. 1997. Dairy Plant Engineering and Management. 4th Ed. Kitab Mahal.
2. Rao, D.G. Fundamentals of Food Engineering. PHI learning Pvt. Ltd. New Delhi.
3. Singh, R.P. & Heldman, D.R. 1993. Introduction to Food Engineering. Academic Press.
4. Dash, S K, Rayaguru K, Khan, M K. 2012. Concepts in Dairy and Food Engineering. OUAT, Bhubaneswar, 114 p.

Reference Books

1. McCabe, W.L. and Smith, J. C. 1999. Unit Operations of Chemical Engineering. McGraw Hill.
2. Singh, R.P. & Heldman, D.R. 1993. Introduction to Food Engineering. Academic Press.
3. Toledo, R. T. 1997. Fundamentals of Food Process Engineering. CBS Publisher.
4. Sahoo, N R, Dash S K, Pal, U S. 2012. Concepts in Food and Dairy Technology