

16FT402 FOOD PROCESS EQUIPMENT DESIGN

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	-	30	10	55	-	-	10	5



Course Description and Objectives:

This course deals with the principles, mechanism, selection and design of different equipments used in food industry. The objective of this course is to introduce students to a wide range of equipments such as heat exchangers, dryers, freezer, filters for different process operations, their design considerations and material selection.

Course Outcomes:

The student will be able to:

- know about the designing aspects of food processing equipment.
- understand the applications of processing equipment in food industry.
- gain knowledge on process parameters in mechanical, thermal and mass transfer operations carried out in food processing.

SKILLS:

- ✓ *Design common equipment used in food processing industries.*
- ✓ *Perform design calculations for heat exchanger, dryer and evaporators.*
- ✓ *Selection and optimization of operating and performance parameters in different food processing equipments.*

ACTIVITIES:

- Solve numerical problems on equipment design.

UNIT - 1**L-9**

DESIGN OF PRESSURE VESSELS, STORAGE TANKS AND PULPER: Application of engineering principles related to design and selection of food processing equipment, Design of pressure vessels and pipe lines, Design aspects of storage tanks, Design of sterilizers and process vats, Design of pulper and crushers, Design considerations, Materials of construction, Installation and operation.

UNIT - 2**L-9**

DESIGN OF FILTERS, HEAT EXCHANGERS AND EVAPORATORS: Design of filtration process, Installation, Operation, Design consideration of membrane separation process, Ultra filtration, Reverse osmosis, Design of heat exchangers, Plate heat exchanger, Shell and tube heat exchangers, Design of finned type heat exchanger, Materials of construction, Installation and operation, Design of single effect evaporators, Applications, Multiple Effect evaporators, Installation and maintenance.

UNIT - 3**L-9**

DESIGN OF DRYERS: Cabinet dryer, Fluidized bed dryer, Vacuum dryer, Foam mat dryer and freeze dryer, Design considerations, Installation, Operation and Maintenance, Design of Extruders, Design considerations of food extruders, Single and twin screw extruders, Installation, Operation and maintenance of food extruders.

UNIT - 4**L-9**

DESIGN OF COLD STORAGE AND FREEZERS: Design of pre cooler, Hydro cooling and forced air cooling, Design of cold storage, Factors to be considered, Estimation of cooling load, Construction and operation-construction, installation and maintenance of cold storage, Design consideration for controlled atmospheric storage and modified atmospheric storage of perishables, Design of freezers, Types of freezers, Design considerations, Construction and operation, Design of frozen storage, Installation and operation.

UNIT - 5**L-9**

DESIGN OF MIXING, SIZE REDUCTION AND CONVEYING EQUIPMENTS: Design consideration of mixing and blending equipment, Design of agitators and scale up, Operation and maintenance, Design consideration of size reduction equipment, Installation and maintenance, Design consideration of material conveying equipment, Belt conveyor, Screw conveyor, Bucket elevator, Pneumatic conveyor.

LABORATORY EXPERIMENTS**LIST OF EXPERIMENTS**

Total Hours: 30

1. Design of pressure vessels and pipe lines.
2. Design of Storage tanks.
3. Design of Sterilizers.
4. Design of Process vats.
5. Design of Pulper- membrane separation process.
6. Design of heat exchangers, evaporators.
7. Design of dryers - cabinet/tray dryer, fluidized bed dryer.
8. Design of mixing and blending equipments.
9. Design of cold storage.
10. Design of conveying equipments.

TEXT BOOKS:

1. C. B. Richey, "Agricultural Engineer's Hand Book", 5th edition, McGraw Hill, 1961.
2. R. T. Toledo, "Fundamentals of Food Process Engineering", 3rd edition, Springer, 1999.

REFERENCE BOOKS:

1. T. Ahmed, "Dairy Plant Engineering and Management", 4th edition, Kitab Mahal, 1997.
2. A. Chakraverty, "Post-harvest Technology of Cereals, Pulses and Oilseeds", 3rd edition, Oxford and IBH Publishing, 1981.
3. C. W. Hall and D. C. Davis, "Processing Equipment for Agricultural Products", 2nd edition, AVI Publisher, 1979.