

17FT012 SEPARATION TECHNIQUES IN FOOD PROCESSING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WARA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Description and Objectives:

- This course deals with various UNIT operations that a food processing industry uses to transform food ingredients into different forms for consumers. Separation techniques may be used to remove skins from fruits, water from juices, or whey from cheese. Each separation technique is customized to the amount of waste that needs to be removed, and the resiliency of the food product being processed.

Course Outcomes:

- To understand various separation techniques applied in food industry.
- To understand separation mechanism of different equipments.
- To understand separation technology for various food products.

SKILLS:

- ✓ Efficient in construction and design of a particular separation equipment.
- ✓ Suggest a particular equipment for separation of food commodities.
- ✓ Understand Operation layout of the modules involved in separation equipments.

UNIT - I

Introduction to various separation processes, Gas-Liquid, Gas–Solid, Liquid-Liquid, Liquid- Solid separation; Concept of phase equilibrium, Stage equilibrium, Stage efficiency, Equilibrium concentration; Single stage contact equilibrium, counter-current multiple contact stages, Concept of equilibrium line and operating line, Determination of optimum number of contact stages by analytical and graphical method.

UNIT - II

Rate of extraction, Rate of gas absorption, Individual and over all mass transfer coefficient; Calculation of tower height for gas absorption for both dilute and concentrated solution. Construction and working mechanism of different extraction equipments like single stage extraction, Multiple stage static bed system, Bollmann extractor, Hildebrandt extractor, Rotocell extractor.

UNIT - III

Solid Separation Process, Introduction, Concept of size, Shape, Cutsizes, Sieving, Magnetic separation, Eddy-current separation, Wet separation, Ballistic separation, Color separation, Wet Separation Process, liquid-solid and liquid- liquid separation by hydrocyclones, Surface velocity classifier, Elutriators, Impingement separator, Electrostatic precipitation, Distillation: Introduction, boiling point diagram, differential or simple distillation, Flash or equilibrium distillation, Continuous rectification with and without reflux, Reflux ratio, Optimum reflux ratio, Batch distillation, Application of distillation in food processing.

UNIT - IV

Membrane Separation Technology: Introduction to micro-filtration, Ultrafiltration, Reverse osmosis, Electro dialyses, dialyses, physical characteristics of membrane separation, Factors affecting reverse osmosis process, Concentration polarization, Design of reverse osmosis and ultra filtration systems, Operation layout of the modules, Electrodialysis, pervaporization, Fabrication of membranes, Application of membrane technology in food industry.

UNIT - V

Powder Technology: Classification of powder, Separation of powder, Sieving, Air classification, Factors affecting air classification, Cyclone application, Air separation, Particle size distribution, Supercritical Fluid Extraction: Introduction, Properties of SCF, Food application, Application of SCFE in analytical technique, Pharmaceutical application.

TEXTBOOKS:

1. Anantharaman N & Begum KMMS. 2001. Elements of Mass Transfer. PHI.
2. Dutta BK. 1985. Mass Transfer & Separation Process. PHI
3. GrandisonAS & LewisMJ. 2002. Separation Process in the Food & Biotechnology Industries. Woodhead Publ.
4. Narayanan CM & Bhattacharyya BC. 2004. Mechanical
5. Operations for Chemical Engineers. Khanna Publ.

REFERENCEBOOKS:

1. Bargale P (1997) Mechanical Oil Expression from Selected Oil- seeds under Uniaxial Compression Saskatoon: Department of Agricultural and Bioresource Engineering, University Saskatchewan, p. 337
2. Barta J, Balla C, Vatai G (2012) Dehydration preservation of fruits. In: Handbook of Fruits and Fruit Processing . New York: Wiley-Blackwell, pp. 133 – 151.
3. Bazinet L, Lamarche F, Ippersiel D (1998) Bipolar-membrane electrodialysis: applications of electrodialysis in the food industry. Trends in Food Science and Technology 9 (3): 107 – 113.

ACTIVITY:

- o Calculate the efficiency of various separation equipments.