



S.No.	Topic	No. of Lectures
6.	To prepare HACCP control chart.	2
7.	To conduct the Survey and study BIS- standards and specifications.	2
8.	To study the FPO standards and specifications.	1
9.	To study the codex standards and specifications.	1
10.	Visits to food industries to study the various quality and safety aspects adopted.	2
	Total	15

X. Suggested Reading

- Herschdoerfer, SM. 1984. *Quality Control in the Food Industry*. Vol. 1 Academic Press.
- Herschdoerfer SM. 2012. *Quality Control in the Food Industry*. Vol. 2 Elsevier Science.
- Hubbard MR. 2003. *Statistical Quality Control for the Food Industry*. Springer.
- Mahadeviah M and Gowramma R V. 1996. *Food Packaging Materials*. Tata McGraw Hill.
- Mehmet M. 2011. *Biosensors in Food Processing, Safety, and Quality Control*. CRC Press.
- Palling SJ. 1980. *Developments in Food Packaging*. Applied Science Publisher.
- Sacharow S and Grittin RC. 1980. *Principles of Food Packaging*. AVI Publisher.
- Yanbo H, Whittaker AD and Lacey RE. 2001. *Automation for Food Engineering*. Food Quality Quantization and Process Control-CRC Press.

I. Course Title : Food Processing Technologies

II. Course Code : PFE 510

III. Credit Hours : 2+1

IV. Aim of the course

To acquaint and equip the students with different unit operations to be performed in food industries and related equipment.

V. Theory

Unit I

Mixing and homogenization; Principles of solid and liquid mixing, types of mixers for solids, liquid and pastes homogenization. Emulsification: Principles and equipments.

Unit II

Novel dehydration technologies; Osmotic dehydration, foam mat drying, puff drying, freeze drying, microwave drying, dehumidified air drying. Extrusion: Theory, equipment, applications.

Unit III

Non-thermal processing; Principles and equipment involved in ohmic heating, pulsed electric field preservation, hydrostatic pressure technique (vacuum processing, high pressure processing of Foods), ultrasonic technology, irradiation, quality changes and effects on microorganisms, nanotechnology in food processing.

Unit IV

Distillation, leaching and extraction: Principles and equipment for distillation, crystallization, phase equilibria, multistage calculations, leaching principles and equipment, solvent extraction, super-critical fluid extraction, near critical fluid extraction: Equipment and experimental techniques used in NCF extraction and

industrial application, advanced methods for extraction of food components and aroma recovery.

Unit V

Food plant hygiene; Cleaning, sterilizing, waste disposal methods, Food processing plant utilities, steam requirements in food processing, HACCP in food processing industries.

VI. Practical

Conducting experiments and solving problems on mixing and mixing indices, homogenization, distillation, crystallisation, extraction, leaching, membrane separation, reverse osmosis and ultrafiltration, design of plate and packed tower, visit to related food industry.

VII. Learning outcome

Student's capability to develop food products using recent techniques as per requirement of food industries.

VIII. Lecture Schedule

S.No.	Topic	No. of Lectures
1.	Mixing and homogenization: Principles of solid and liquid mixing.	1
2.	Types of mixers for solids, liquid and pastes homogenization.	2
3.	Emulsification: Principles and equipments.	1
4.	Novel dehydration technologies: Osmotic dehydration, foam mat drying, puff drying.	2
5.	Freeze drying, microwave drying, and dehumidified air drying.	2
6.	Extrusion: Theory, equipment, applications.	2
7.	Non-thermal processing: Principles and equipment involved in ohmic heating, pulsed electric field preservation.	2
8.	Hydrostatic pressure technique (vacuum processing, high pressure processing of Foods), ultrasonic technology.	2
9.	Irradiation, quality changes and effects on microorganisms, nanotechnology in food processing.	2
10.	Distillation; Principles and equipment for distillation.	2
11.	Leaching; Principles and equipment.	2
12.	Extraction; Solvent extraction, crystallization, phase equilibria, multistage calculations.	3
13.	Super-critical fluid extraction, near critical fluid extraction: Equipment and experimental techniques used in NCF extraction and industrial application.	3
14.	Advanced methods for extraction of food components and aroma recovery.	1
15.	Food plant hygiene; Cleaning, sterilizing, waste disposal methods. Food processing plant utilities, steam requirements in food processing.	2
16.	HACCP in food processing industries.	1
	Total	30



IX. List of Practicals

S.No.	Topic	No. of Practicals
1.	Conducting experiments and solving problems on mixing and mixing indices.	2
2.	To conduct the experiment on homogenization.	2
3.	To study the process of crystallization.	1
4.	To conduct the experiment on extraction.	2
5.	Experimentation on leaching process.	1
6.	To study the membrane separation process.	1
7.	To conduct the experiment on reverse osmosis technique.	1
8.	To conduct the experiment on ultrafilteraion process.	1
9.	Design of plate and packed tower.	2
10.	Visit to related food industry.	2
	Total	15

X. Suggested Reading

- Brennan JG, Butters JR, Cowell ND and Lilly AEI 1990. *Food Engineering Operations*. Elsevier.
- Earle RL. 1985. *Unit Operations in Food Processing*. Pergamon Press.
- Fellows P. 1988. *Food Processing Technology: Principle and Practice*. VCH Publisher.
- Geankoplis JC. 1999. *Transport Process and Unit Operations*. Allyn & Bacon.
- Gould GW. 1996. *New Methods of Food Preservation*. Blackie Academic & Professional.
- Heldman DR and Lund BD. 1992. *Hand Book of Food Engineering*. Marcel Dekker.
- McCabe WL and Smith JC. 1999. *Unit Operations of Chemical Engineering*. McGraw Hill.
- Sahay KM and Singh KK. 1994. *Unit Operation of Agricultural Processing*. Vikas Publ. House.
- Singh RP 1991. *Fundamentals of Food Process Engineering*. AVI Publisher.
- Singh RP and Heldman DR 1993. *Introduction to Food Engineering*. Academic Press.

I. Course Title : Food Processing Equipment and Plant Design

II. Course Code : PFE 511

III. Credit Hours : 1+1

IV. Aim of the course

To acquaint and equip the students with the design features of different food processing equipment being used in the industries along with the layout, planning of different food processing plants.

V. Theory

Unit I

Design considerations of processing agricultural and food products.

Unit II

Design of machinery for drying, milling, separation, grinding, mixing, evaporation, condensation, membrane separation.

Unit III

Human factors in design, selection of materials of construction and standard component, design standards and testing standards. Plant design concepts and general design considerations: Plant location, location factors and their interaction with plant location, location theory models, and computer aided selection of the location.