DISCIPLINE SPECIFIC CORE COURSE

DSC FT14: Food Engineering II

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITE OF THE COURSE

Course title & code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Theory	Tutorial	Practical/Practice		
Food Engineering II	4	3	0	1	XII Pass with PCM/PCB	Appeared in Food Engineering- I

Learning Objectives

- To understand the principle of size reduction and mixing unit operations
- To acquaint with fundamentals of fluid flow process and psychrometrics
- To understand the basics of designing of evaporator and dehydrator

Learning Outcomes

After completing this course, students will be able to:

- Apprehend the principles of size reduction and mixing unit operations.
- Comprehend the applications of fluid flow, steam and psychrometrics
- Understand basic design of evaporator and dehydrator used in food processing
- Apply these principles for solving numerical problems

SYLLABUS OF DSC FT14

THEORY
Credits: 3; Hours: 45

UNIT I: Introduction to Size Reduction and Mixing Operations 10 hours

Unit Description: The unit will provide information on the application of size reduction and mixing unit operations in food processing industry.

Subtopics:

- Introduction of size reduction and mixing operation
- Types of size reduction
- Size reduction equipment (crusher, grinding mill, pulveriser, roller mill, knife cutter)
- Application of size reduction

- Size separation, screening, screening equipment and applications
- Mixing equipment for solids and pastes (Planetary mixer, Kneader, Ribbon mixer, Double cone mixer)
- Applications of mixing in solids and fluids

UNIT II: Fluid Flow in food Processing 11 hours

Unit Description: The unit will provide knowledge of fluid characteristics, viscometers and pressure measuring devices

Subtopics:

- Liquid Transport systems
- Newton's Law of Viscosity
- Principle and operation of Capillary tube and rotational viscometer
- Properties of Non-Newtonian fluids
- Flow characteristics, Reynolds Number, Bernoulli's Equation
- Concept of Flow Measurement devices

UNIT III: Steam and Evaporation 12 hours

Unit Description: The unit will provide an understanding of generation of steam process, functioning and designing of evaporators

Subtopics:

- Generation of steam
- Construction and functions of fire tube and water tube boilers
- Thermodynamics of Phase change
- Steam tables
- Boiling point elevation
- Types of evaporators
- Design of single effect evaporators

UNIT IV: Psychrometrics and Dehydration 12 hours

Unit Description: The unit will provide knowledge of the psychrometrics, dehydration process and designing of dehydrator

Subtopics:

- Properties of dry air, water vapour, air vapour mixture
- Psychrometric Chart and its application
- Basic Drying Process
- Moisture content on wet basis and dry basis
- Dehydration systems
- Dehydration system Design

PRACTICAL
Credit: 1; Hours: 30

1. Screen analysis of food sample
2. Study the effect of temperature on viscosity of Newtonian / non-Newtonian fluids
3. Operation of pressure measuring instrument
4. Study properties of moist air using Psychrometer and psychrometric chart
5. Determination of evaporation rate of given food sample
6. Determine elevation in boiling point of given solution
7. Study steam table and its application

8. Operation of tray dryer and drying process calculations
9. Determination of drying characteristics of given food sample

Essential Readings

- Fellows, P. (2009). *Food processing technology*. Woodhead publication, 3rd edition
- Rao, D.G. (2010). *Fundamentals of food engineering*. PHI learning private ltd.
- Singh, R.P. and Heldman, D.R. (1993) *Introduction to food engineering* 2nd edition. Academic press
- Singh, R.P. and Heldman, D.R. (2014) *Introduction to food engineering* 5th edition. Academic press

Suggested Readings

- Earle, R.L. (1983). *Unit Operations in Food Processing,* 2nd edition. Pergamon press.
- Garg, M.**,** Chaturvedi, S., Sadhu, S.D. and Barwa, M. and Pani. B ., (2020) *Practical Handbook of Food Engineering* Aryush Education, ISBN NO. 978-81-930437-5-2
- Jafari, Seid Mahdi, ed. (2021) Engineering Principles of Unit Operations in Food Processing: Unit Operations and Processing Equipment in the Food Industry. Woodhead Publishing.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.