



FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Food Processing Technology)

Semester: VI

Course Code: 202070602

Course Title: Food Engineering Operations-2

Course Group: Professional Core Course

Course Objectives: Food engineering operations-II is a multidisciplinary field of applied physical sciences, which combines science, microbiology, and engineering education for food and related industries. This subject presents a comprehensive treatise of all normally used food engineering operations that are employed or applied for separation, preservation or conversion purposes in the Food industry.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	0	2	4	50/18	50/17	25/9	25/9	150/53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Pasteurization and Sterilization: Introduction, Holding Method, High Temperature Short Time Pasteurization, Bottle Sterilization, UHT Processing, Direct and Indirect Heating, Fouling of Heat Exchanger and De-scaling, Thermal Process calculations	09
2	Homogenization and Centrifugation: Homogenization Mechanism Theory, Technical Execution, Efficiency of Homogenization, Centrifugation and Gravitational separation, Stokes Law, Construction of Separator Clarifiers and Separators, Factors affecting efficiency of Separation, Flow Rate, Bactofuge Treatment	08
3	Freezing: Freezing curve, Planck's Equation for food freezing, Ice Cream Freezer: batch freezer and continuous Freezer	05
4	Distillation: Introduction, Flash distillation, Batch distillation Continuous distillation with reflux, Application of distillation in food processing.	07



5	Leaching and Extraction: Principle of leaching and its equipment, Principle of extraction and its equipment, Application of leaching and extraction in food processing.	06
6	Crystallization: Equilibria and yields, Nucleation, Crystal growth, Crystallization equipments, Food industry application.	04
7	Filtration: Theory of filtration, rate of filtration, pressure drop during filtration, applications, constant-rate filtration and constant pressure filtration, Filtration equipment; filter aids	05
	Total	45

List of Practicals / Tutorials:

1	To determine the adequacy of pasteurization
2	To determine the adequacy of sterilization
3	To study the process of gravitational sedimentation and to determine rate of sedimentation of suspended solids
4	To study the effect of solvent temperature in leaching process of beetroot
5	To study and perform the crystallization process and estimate the yield of the process
6	To study constructional details of a centrifugal disc type cream separator
7	Determination of freezing times in foods by using Planck's equation
8	To estimate the composition of products obtained in flash and batch distillation operation.
9	To estimate the number of theoretical plates required in continuous distillation operation.
10	To calculate the specific resistance of the cake for filtration process
11	To study laboratory scale homogenizer

Reference Books:

1	Unit operations of chemical engineering by McCabe and Smith. McGraw-Hill
2	Chemical engineering handbook by Perry RH. McGraw-Hill
3	Dairy plant engineering and management by Tufail Ahmad, Kitab Mahal Publications
4	Engineering for dairy and food product by Farrall AW. John Wiley and Sons
5	Fundamentals of Food Process Engineering by Toledo RT, Singh RK, Kong F. Springer Nature

Supplementary learning Material:

1	http://rpaulsingh.com/learning/videos/video_top.html
2	http://foodscience.uark.edu/
3	http://rpaulsingh.com/lectures/lecturelist.html
4	http://www.bbc.co.uk/bitesize/ks3/science/chemical_material_behaviour/compounds_mixtures/revision/9/
5	http://www.britannica.com/EBchecked/topic/108875/separation-and-purification

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz



- Continuous assessment
- Interactive methods
- Industrial/ Field visits
- Course Projects

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
15%	40%	25%	10%	10%	0%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the concept of thermal processing such as pasteurization and sterilization	25
CO-2	Understand the centrifugation and homogenization and apply in relevant food industry.	20
CO-3	Understand the concepts of freezing and different freezing equipments used in food industry.	8
CO-4	Conceptualize the distillation and its application in food industry	20
CO-5	Understand the unit operations such as extraction, leaching, crystallization, filtration and their applications in food industry.	27

Curriculum Revision:

Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025