



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Food Processing Technology)

Semester: VI

Course Code: 202070605

Course Title: Thermal & Non-Thermal Processing of Foods

Course Group: Professional Elective Course- I

Course Objectives: To understand the fundamentals and principles of thermal processing such as steam pasteurization, sterilization, extrusion, frying. To learn non-thermal method of food processing which can minimize the disadvantages of thermal processing.

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	Thermal Process Calculation: Survivor curve, Concept of Thermal Death Time, Thermal resistance curve and z value, Commercial sterility, Probability of spoilage, Lethal rate and lethality, Method for process time calculation. Concept of rate constant, Q value and shelf life.	10
2	Blanching, Pasteurization & sterilization: Steam blanchers, Hot-water blanchers. Pasteurization of Foods: Theory and equipments. Bulk Canning/In-container sterilization: Theory and Equipment. Aseptic Processing: Theory and Equipment.	08
3	Hurdle Technology, Extrusion and Frying: Hurdle Technology: Concept and applications. Extrusion: Theory, Equipment and application. Frying: Theory and Equipment.	08
4	Dielectric, Ohmic, Infrared Heating and Irradiation: Dielectric Heating: Theory, equipment and application. Ohmic Heating: Theory, equipment and application. Infrared Heating: Theory, equipment and application. Irradiation: Theory and application	10



5	Pulsed electric field, HPP, Pulsed light and Ultrasound processing: Pulsed electric field processing: Theory and Equipment. High pressure processing: Theory and Equipment. Processing using pulsed light: Theory and Equipment. Processing using ultrasound: Theory and application.	09
	Total	45

List of Practicals / Tutorials:

1	Study of effect of blanching on food.
2	Study of effect of frying treatments on quality parameters of food.
3	Study of extruder components.
4	Effect of extruder variables on food.
5	Estimation of spoilage probability.
6	Estimation of D and Z value of microorganism/enzymes in food.
7	Calculation of thermal process time using graphical method.
8	Calculation of thermal process time using improved graphical method.
9	Estimation of rate constant of food deterioration.
10	Calculation of shelf life and accelerated shelf life of food.

Reference Books:

1	Introduction to Food Engineering, 4th Edition, R.P. Singh and D.R. Heldman, Academic Press, NY, 2009.
2	Food Processing Technology: Principles and Practice, P.J. Fellows, CRC Press, Boca Raton, FL, 2000.
3	Handbook of Food Preservation, M. Shafiur Rehman, CRC Press, Boca Raton, 2007
4	Fundamentals of Food Process Engineering, R.T. Toledo, 3 rd edition, 2007, Springer.
5	Food Engineering Operations, Brennan JG, Butters JR, Cowell ND & Lilly AEI. 1990, Elsevier.
6	Food Extrusion, Vol. I and II. J.M. Harper, CRC Press Boca Raton FL, 1980.
7	New Methods of Food Preservation (Non Thermal Processing of Foods) G. W. Gould.
8	Emerging Technologies for Food Processing, Da-Wen Sun (Ed.) Elsevier Academic Press, U.K., 2005.
9	Non-Thermal Preservation of Foods, G.V. Barbosa-Canovas, U.R. Pothakumary, E. Palou, B.G. Swanson, Marcel Dekker, New York, 1998.

Supplementary learning Material:

1	https://nptel.ac.in/courses/126/103/126103017/
2	https://www.youtube.com/watch?v=ZwBoZVrZxbk&list=PL2E9-TlQKsGRQy05HBihSowy1WP9HBtdy
3	https://www.digimat.in/nptel/courses/video/126105011/L12.html
4	https://nptel.ac.in/courses/126105015/

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%	20%	15%	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 blanching, pasteurization and canning concepts.	21
CO-2	Calculate the thermal process time for food products.	17
CO-3	Estimate the rate of deterioration and shelf life of food products.	05
CO-4	Understand hurdle technology, extrusion and frying concepts.	15
CO-5	Understand the mechanism of irradiation, ohmic, infrared and dielectric heating.	21
CO-6	Understand the concepts of novel food processing technologies.	21

Curriculum Revision:

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