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Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Master of Technology (Food Technology)

Semester: 1

Course Code: 202380107

Course Title: Engineering Properties of Foods and Applications

Course Group: Program Elective I

Course Objectives:

1. To use fundamentals of mechanics and strength of materials to understand the engineering properties of biomaterials.
2. To solve the problems while designing and selecting the means and modes of preservation, packaging, processing, storage, marketing, and consumption.

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	50/20	50/20	25/10	25/10	150/60

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

Detailed Syllabus:

Sr.	Conten	Hours
1	Measurement Techniques of density, porosity, surface area, prediction of surface area of Euclidian and Non Euclidian geometry. Rheological Models for Viscous Foods, Quasistatic Tests for Solid Foods, Dynamic Testing of Solid Foods, Textural profile analysis of food products.	8
2	Thermal Properties of Unfrozen Foods: Specific Heat Capacity, Predictive Equations of Thermal Conductivity, Compressibility and Thermal Expansion, Glass Transitions, Sorption and Hydration Properties. Thermal Properties of Frozen Foods: Experimental Approaches to Measuring the Thermal Properties, Modeling of the Thermal Properties of Frozen Foods	7



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3	Properties Relevant to Infrared Heating of Foods: Emission and Emissivity, Reflection, Absorption, and Transmission, Absorptivity and Emissivity, Attenuation or Extinction, Use of the Radiative Properties in Modeling of Heat Transfer. Thermodynamic Properties of Foods in Dehydration: Chemical Potential and Phase Equilibria, Fugacity and Activity, Water Activity in Foods, Moisture Sorption Isotherms, Sorption Energetics	7
4	Dielectric Properties of Foods: Radiofrequency vs. Microwave Heating, Frequency Dependence in Food Materials, Dielectric Properties below Freezing and above Boiling Temperatures, Temperature Dependence of Loss Factor and Runaway Heating, Effects of Processing and Storage on Dielectric Properties of Foods	7
5	Surface Properties: The Gibbs Adsorption Equation, The Contact Angle, Colorimetric Properties of Foods: Measurement of Color, Spectrophotometry, Tristimulus Colorimetry, Color Tolerances	6

List of Practicals / Tutorials:

1	Measurement of physical properties of food grains
2	Calculation of surface area of Euclidian and Non Euclidian geometry
3	Measurement of Flow Properties of Fluid Foods.
4	Evaluation of textural profile of food products
5	Understanding of Software for Predicting Thermal Properties of Foods
6	Modeling of the Thermal Properties of Frozen Foods
7	Measurement of Water Activity of food product
8	Analysis of Effect of Temperature on Moisture Sorption Isotherms
9	Study of Dielectric Properties of Fruits and Vegetables
10	Measurement of Tristimulus Color value of food product.

Reference Books:

1	Figura, L. O. - Teixeira, A. A. 2007. Food Physics. Springer
2	Sahin S. and Sumnu S.G. (2006). Physical Properties of Foods. Springer
3	Steffe J. 1996. Rheological Methods in Food Process Engineering. Freeman Press, East Lansing, MI, USA.
4	Rao, M. A.; Rizvi, S. S. H.; Datta, Ashim K. 2005, Engineering Properties of Foods. Taylor & Francis
5	J. M. Aguilera & D. W. Stanley Micro-structural principles of food processing and Engineering
6	N. N. Mohsenin ; Physical properties of plant and animal materials



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Supplementary Reading Material :

1	www.onlinelibrary.wiley.com/journal/10.1111/(ISSN)1365-2621
2	www.journals.elsevier.com/lwt-food-science-and.../open-access-articles

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						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
15	20	20	20	25	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	%weightag
CO-1	Understand the concept of physical and rheological properties of food	23
CO-2	Develop the concept of thermal properties of unfrozen and frozen foods	20
CO-3	Understand the concept of properties relevant to infrared heating of foods and thermodynamic properties of foods in dehydration	20
CO-4	Understanding the dielectric properties, surface properties and colorimetric properties of foods	37

Curriculum Revision:

Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025