



GUJARAT TECHNOLOGICAL UNIVERSITY

BACHELOR OF ENGINEERING SYLLABUS

Subject Code : 3155107

Subject Name : Food Engineering Operations – I

WEF Academic Year :	2023-24
Semester :	5
Category of the Course :	Open Elective

Prerequisite:Nil

Rationale: This subject includes broad categories of unit operation like drying, particle size reduction/separation, Study properties of Grains, Storage and material handling Equipments.

Course Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Practical		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	2	3	70	30	30	20	150

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	Introduction: Structure and composition of food grains, Engineering properties of agricultural materials, Physical properties, Mechanical properties, Thermal properties, Rheological properties	7	15
2	Cleaning, Grading and Separation: Screening, Types of screens, Grizzly, Revolving screen, Shaking screen, Rotary screen, Vibratory screen, Horizontal screen, Perforated metal screen, Wire-mesh screen, Ideal and actual screen, Effectiveness of screen, Airscreen cleaners, Screen analysis, Fineness modules, Crushing efficiency, Size reduction procedures, Grading- Size grading, Colour grading, Specific gravity grading, Magnetic separation, Energy requirements in size reduction	14	22
3	Heat and Mass Transfer: Heat Transfer: Law of conduction, Steady and unsteady state conduction, Natural convection, Forced convection in laminar and turbulent flow, Emission of radiation, Combined heat transfer by conduction, Convection and radiation, Mass transfer: Theory of diffusion, Prediction of diffusivities, Mass transfer theories- Film theory, Boundary layer theory, Two film theory, Mass transfer coefficients, Transport phenomena, Finite	15	25



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	element techniques and molecular transport in gas, Solids and liquid.		
4	Storage: Direct damages, Indirect damages, Sources of infestation, Traditional storage structures, Improved storage structures, Modern storage structures, Storage of agricultural perishables, Controlled and modified atmospheric storage, Sources of infestation and control.	9	20
5	Material Handling: Belt conveyors, Belt tension, Bucket Elevator, Screw conveyor, Drive mechanism, Pneumatic and hydraulic conveying systems.	5	18

Reference Book:

1. Unit Operations of Agricultural Processing by Sahay K.M. and Singh K.K., Vikas Publishing House.
2. Physical Properties of Plant and Animal Products by Mohsenin N.N., Gordon and Breach.
3. Unit operations of chemical engineering by McCabe and Smith, McGraw-Hill.
4. Introduction to Food Engineering, 3rd Edition, R Paul Singh, Dennis R Heldman, Academic Press, USA.
5. Food Processing Technology: Principles and Practice, by P J Fellows, Woodhead Publishing Limited, Cambridge England

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level*
01	Understanding of the engineering properties of food materials	RM
02	Ability to understand different types of cleaning, grading, separation and size reduction equipment.	UN
03	Understand heat and mass transfer in food.	AN
04	Understand different storage structure for food grains	AP

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

1. Determination of size and sphericity of agricultural materials given
2. Determination of bulk density of different materials
3. Determination of dynamic angle of repose of given grains
4. Determination of the rate of drying for given food product
5. To find the fineness modulus and average particle size in ground product
6. To study the rate of drying for given food material using vacuum dryer
7. To study the specific gravity separator as separation machinery
8. To study the clean-O-grader as separation machinery
9. To study different types of size reduction equipments.
10. Study of different conveying equipments used in food material handling



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Major Equipments:

1. Vacuumdryer
2. Axial flow traydryer
3. Gravityseparator
4. Clean – O –grader
5. Angle of repose setup
6. Sieve shaker
7. Hammer mill
8. Ball mill

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