

22PAFE201 ENGINEERING PROPERTIES OF AGRICULTURAL PRODUCE

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of physical, thermal and frictional properties of agricultural produce.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to evaluate different physical properties as well as thermal properties of agricultural produce. It also helps us to execute different grain storage structures or handling equipments by knowledge of different frictional properties of grain.

MODULE-1

UNIT-1

4L+0T+8P=12 Hours

BASICS OF ENGINEERING PROPERTIES:

Classification and importance of engineering properties of Agricultural Produce. Physical properties. Thermal properties of Agricultural Produce. Electrical properties of Agricultural Produce.

UNIT-2

4L+0T+8P=12 Hours

DETERMINATION OF ENGINEERING PROPERTIES:

Determination of shape, size, roundness, sphericity, volume, density, porosity, specific gravity, surface area of grains, fruits and vegetables, Determination of Heat capacity, Specific heat, Thermal conductivity, Thermal diffusivity, Heat of respiration; Co-efficient of thermal expansion, Dielectric loss factor, loss tangent, A.C. conductivity and dielectric constant, method of determination.

PRACTICES:

- Determination of the shape and size of grains of fruits and vegetables.
- Determination of bulk density and particle density/true density and porosity of solid grains.
- Finding the thermal conductivity of different grains.
- Determination of specific heat of some food grains.

MODULE-2

UNIT-1

4L+0T+8P=12 Hours

FRICTIONAL PROPERTIES:

Friction in agricultural materials; Flow of bulk granular materials; Aero dynamics of agricultural products. Rheological properties.

UNIT-2

4L+0T+8P=12 Hours

APPLICATION OF FRICTIONAL PROPERTIES:

Determination of Static friction, Kinetic friction, rolling resistance, angle of internal friction, angle of repose, drag coefficients, terminal velocity. Force, deformation, stress, strain, elastic, plastic and viscous behaviour, Newtonian and Non-Newtonian liquid, Visco-elasticity, Newtonian and Non-Newtonian fluid, Pseudo-plastic, Dilatant, Thixotropic, Rheopectic and Bingham Plastic Foods, Flow curves. Application of engineering properties in handling processing machines and storage structures.



Source:
<https://previews.123rf.com/images/galdzer/galdzer0904/galdzer090400177/4677435-wheat-and-hands-of-the-old-farmer-harvesting.jpg>

SKILLS:

- ✓ Compute engineering properties of agricultural products and predict their nature at different operation in industry.
- ✓ Optimize processing parameter of different unit operations by acquiring knowledge of characteristics of properties.
- ✓ Design different grain storage structures such as silos, bins and conveying equipment's based on frictional properties and flow behavior of materials.

PRACTICES:

- Determination of angle of repose of grains.
- Finding the co-efficient of external and internal friction of different crops.
- Finding out the terminal velocity of grain sample.
- Study of separating behaviour in a vertical wind tunnel.
- Determination of hardness of food material.
- Determination of viscosity of liquid foods.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Illustrate different properties of agricultural produce.	Apply	1	1, 2, 4
2	Analyze knowledge of properties of agricultural produce during packaging, material handling and other unit operation in industry level.	Analyze	1	1, 2, 3, 4, 5
3	Examine the problems which take place in industry while thermal properties of agricultural produce is considered.	Evaluate	2	1, 2, 3, 4, 5
4	Evaluate different process equipments by considering several rheological properties.	Evaluate	2	1, 2, 4
5	Apply aerodynamic properties to develop different storage structures.	Create	2	1, 2, 3, 4, 5, 7, 11

TEXT BOOKS:

1. Rao, M.A. and Rizvi, S.H., "Engineering Properties of Foods" Marcel Dekker Inc. New York, 2016.
2. Mohesin, N.N. "Physical Properties of Plants and Animals" Gordon and Breach Science Publishers, New York, 2015.

REFERENCE BOOKS:

1. Mohesin, N.N. "Thermal Properties of Foods and Agricultural Materials" Gordon and Breach Science Publishers, New York, 2012.
2. Prentice, J.H. "Measurement in Rheological Properties of Food Stuffs" Elsevier Applied science Pub. Co. Inc. New York, 2012.
3. Singhal OP & Samuel DVK. "Engineering Properties of Biological Materials" Saroj Prakashan, 2009.