

Objective

To acquaint and equip the students with different techniques of measurement of engineering properties and their importance in the design of processing equipments.

TheoryUNIT I

Physical characteristics of different food grains, fruits and vegetables; Shape and size, description of shape and size, volume and density, porosity, surface area. Rheology; ASTM standard, terms, physical states of materials, classical ideal material, rheological models and equations, visco-elasticity, creep-stress relaxation, Non-Newtonian fluid and viscometry, rheological properties, force, deformation, stress, strain, elastic, plastic behaviour.

UNIT II

Contact stresses between bodies, Hertz problems, firmness and hardness, mechanical damage, dead load and impact damage, vibration damage, friction, effect of load, sliding velocity, temperature, water film and surface roughness. Friction in agricultural materials, rolling resistance, angle of internal friction, angle of repose, flow of bulk granular materials, aero dynamics of agricultural products, drag coefficients, terminal velocity.

UNIT III

Thermal properties: Specific heat, thermal conductivity, thermal diffusivity, methods of determination, steady state and transient heat flow. Electrical properties; Dielectric loss factor, loss tangent, A.C. conductivity and dielectric constant, method of determination, energy absorption from high- frequency electric field.

UNIT IV

Application of engineering properties in design and operation of agricultural equipment and structures.

Practical

Experiments for the determination of physical properties like, length, breadth, thickness, surface area, bulk density, porosity, true density, coefficient of friction, angle of repose and colour for various food grains, fruits, vegetables, spices and processed foods, aerodynamic properties like terminal velocity, lift and drag force for food grains, thermal properties like thermal conductivity, thermal diffusivity and specific heat, firmness and hardness of grain, fruits and stalk, electrical properties like dielectric constant, dielectric loss factor, loss tangent and A.C. conductivity of various food materials.

Suggested Readings

Mohesenin NN. 1980. *Physical Properties of Plant and Animal Materials*.

Gordon & Breach Science Publ.

Mohesenin NN. 1980. *Thermal Properties of Foods and Agricultural*

Materials. Gordon & Breach Science Publ.

Peleg M & Bagelalay EB. 1983. *Physical Properties of Foods*. AVI Publ.

Rao MA & Rizvi SSH. (Eds.). 1986. *Engineering Properties of Foods*.

Marcel Dekker.

Ronal Jowitt, Felix Escher, Bengt Hallsrram, Hans F, Th. Meffert, Walter EC

Spices, Gilbert Vox. 1983. *Physical Properties of Foods*.