

SUBJECT PROPOSAL

Subject Title: Food Rheology

Course Instructor

Dr. Jayeeta Mitra

Assistant Professor

Agricultural and Food Engineering Department

IIT Kharagpur, Email: Jayeeta.mitra@agfe.iitkgp.ernet.in

Contents and Lecture Hours

Topic of lecture(s)	Hr (s)
1. Introduction: The Basics of Rheology a) Stress and Strain Tensors b) Stress-Strain Behaviour of Solid Foods c) Shear Stress-Shear Rate Relationships for fluid food d) Phase Transitions in Foods e) Types of Fluid Flow Behaviour f) Viscometric Properties, Apparent Viscosity, Intrinsic Viscosity	4
2. Measurement of rheological properties: a) Rheological Measurement b) Tube viscometers c) Rotational Viscometers d) Pressure-Driven Flow Viscometers e) Extensional Flow Viscometry	4
3. Rheological modeling of fluid food a) Time-Independent Flow Behaviour, Apparent Viscosity-Shear Rate Relationships of Shear-Thinning Food b) Models for Time-Dependent Flow Behaviour c) Role of Solids Fraction in Rheology of Dispersions, Emulsion d) Effect of solute concentration on viscosity e) Effect of Temperature on Viscosity f) Mixing of Two Component Blends	6
4. Rheology of Food Gum and Starch Dispersions a) Rheology of Food Gum b) Rheology of starch dispersion c) Viscous and Viscoelastic Properties during Heating of Starch Dispersions d) Dynamic Rheological Behaviour of Starch Dispersions e) Role of Continuous and Dispersed Phases on Viscoelastic Properties of Starch Dispersions f) Rheological Behavior of Starch-Protein Dispersion	6
5. Rheological Behavior of Processed Fluid and Semisolid Foods a) Effect of solute concentration on rheological properties of fruit juice and purees	6

b) Rheology of chocolates c) Rheology of Milk and Milk Concentrates, d) Rheology of Mayonnaise, Salad Dressing, and Margarine. e) Structural Analyses of Food Dispersions	
5. Rheological behavior of food gels a) Gel Systems and their rheological properties b) Mechanisms of Gelation c) Theoretical modelling of gels d) Gel Point and Sol-Gel Transition by Rheological Measurements	5
6. Role of Rheology in Food Handling and Processing a) Velocity Profiles in Tubes b) Energy Requirements for Pumping, Pump Selection and Pipe Sizing c) Power Consumption in Agitation d) Residence Time Distribution in Aseptic Processing Systems e) Heat Transfer to Fluid Foods f) Continuous Flow Sterilization g) role of rheology in thermal processing of foods h) empirical models of rheology	7
7. Sensory assessment and Rheology a) Role of Rheological Behaviour in Sensory Assessment of Foods and Swallowing b) Stimuli for Evaluation of Viscosity c) Spreadability: Using Force and Under Normal Gravity	2
TOTAL	40