

FST-343, Engineering Properties of Food 3(3-0)

Educational Objectives:

This course introduces methods to measure, predict and calculate the thermo-physical engineering properties of complex food systems including heat transfer, mass transfer, thermodynamic and Newtonian and non-Newtonian fluid properties. Refrigeration, fluid flow, and mass transfer based unit operations from the food industries are examined and used to demonstrate the application of these principles and properties.

Course outcomes:

1. Solve heat and mass transfer and fluid flow problems using the fundamental principles of fluid flow, thermodynamics, mass conservation and transfer in unit operations.
2. Select and apply appropriate methods to characterize fluid rheology.
3. Determine thermo/physical properties, heat and mass transfer coefficients, and psychrometric data from appropriate sources including tabulated and graphical resources, and prediction/estimation equations.

Course Contents

- Thermal Properties,
- Thermal Conductivity, Specific Heat,
- Enthalpy, Latent Heat, Surface Properties,
- Surface and Interfacial Tension,
- Colloidal Systems (Emulsions, Foams, Gels); Interactions in Foods,
- Colloidal Interactions, Electrostatic Interaction,
- Hydrogen Bonds, Hydrophobic Interactions, Salt Bridges,
- Interactions Due to Polymer Adsorption,
- Depletion Interaction, Rheological Properties,
- Rheological Classification, Measurement of Rheological Properties,
- Mechanical and Textural Properties, Strength,
- Elongation at Break, Toughness, Compression, Fracture, Young's Modulus,
- Texture Profile Analysis,
- Water Activity and Sorption Isotherms, Prediction and Measurement,
- Effect of Temperature and Pressure on Water Activity,
- Adjustment of Water Activity,
- Measurement of Viscosities,
- Measurement of Textural Properties,

- Measurement of Mechanical Properties,
- Measurement of Optical Properties,
- Measurement of Water Activity of Foods

Recommended Books

1. Engineering Properties of Foods, *Edited By, M. A Rao, 2004*
2. Physical properties of foods: novel measurement techniques and applications, Igacio Arana, 2011