

LECTURE SCHEDULE

Department: Dairy Engineering

Course No. - DTE- 321

Course Title: Food Engineering

Credit Hrs - 3 (2+1)

Course Teacher: Dr. Jahangir Badshah

Theory

S. No.	Topics to be covered	No. of Classes
1	Definition and concept of Food Engineering.	01
2	Rheology of processed food and properties of fluid foods.	01
3	Derivation of velocity distribution profile in laminar flow for Newtonian Fluid foods.	01
4	Power Law Model for non Newtonian fluid foods and generalized model for mixed flow foods.	01
5	Rheological method and Measurement of rheological parameters: Capillary tube viscometer, Tube viscometer and Concentric cylinder viscometer.	03
6	Cone and Plate viscometer in rotating and oscillating mode.	01
7	Time dependent fluid foods: Thixotropic and Rheotectic fluids.	01
8	Properties of granular food and powders and Properties of solids foods Bulk density and Angle of internal friction, angle of repose and porosity of powder.	02
9	Viscoelastic models: Maxwell model, Kelvin model, Burger Models with example.	02
10	Measurement of food texture. Compression decompression cycle tests for Primary and secondary textural properties of foods.	01
11	Food Freezing: Thermal properties of frozen foods.	01
12	Predication of freezing rates. Plank's equation and its derivation for freezing time.	02
13	Numerical on freezing time using Plank equation.	01
14	Design of food freezing equipment and numerical solutions.	01
15	Air blast freezers and Plate freezers	02
16	Spiral freezers and immersion freezers and IQF	01
17	Storage of frozen foods. Freeze concentration.	01
18	Food dehydration: Estimation of drying time for food products, constant rate period and falling rate period dehydration.	01

19	Diffusion controlled falling rate period.	01
20	Use of heat and mass balanced in analysis of continuous dryers.	01
21	Numerical on dehydration time.	01
22	Classification of driers: Tray, Vacuum, Vacuum band.	01
23	Tunnel, Bin and Solar drying.	01
24	Freeze drying, Spin flash, Industrial freeze drying. Related numerical.	02
25	Freeze dehydration: Heat and mass transfer and Calculation of drying time.	01
26	Equipment for pulping and fruit juice extraction.	02
27	Equipment for blanching and distillation.	02
28	Objective of size reduction, Sieve analysis, Tyler mesh size equivalent.	01
29	Equipment for dehulling, size reduction and milling.	02
30	Method of milling: Wet milling and Dry Milling. Selection of equipments.	01
31	Rittinger's law, Kick's Law, Bond's law for power and energy analysis in size reduction.	02
32	Selection criteria for size reduction equipments. Roller mill and ball mill.	01
33	Equipments for extrusion. Operation and maintenance.	02
	Total	45

Practical (DTE -321)

S. No.	Practical to be covered	No. of Classes
1	To determine physical properties of food product: Density, specific gravity etc.	01
2	To determine Arrhenius model to observe the effect of temperature using water and milk.	01
3	To determine Rheology of fruit juice.	01
4	To determine Rheology of concentrated milk using Rheomat/Brookfield Viscometer. i.e. Concentric cylinder viscometer.	01
5	To study Rheology of viscous product using cone and plate viscometer.	01
6	To study food freezers.	01
7	To study freeze drier.	01
8	To determine drying characteristics of food product.	01
9	To compare various drying methods.	01
10	To solve the design numerical on different drying methods.	01
11	To compare hot water and steam blanching.	01
12	To study construction and working of distillation system.	01
13	To study various size reduction equipments.	01
14	Visit to cold storage.	01
15	Visit to food processing plant.	01
16	Visit to size reduction unit, Dehuller and extrusion units.	01
17	Study of Rheology of Paneer using Instron testing machine.	01
	Total	17

Suggested Reading:

1. Introduction to Food Engineering by R. Paul Singh and D. R. Heldman (1984), academic Press, INC. Orlando, Florida 32887.
2. Food Engineering and Technolog by Professor Dr. – Ing. H. G. Kessler (1981), Verlag A. Kessler, P.O.Box 1721, D- 8050 Freising (F. R. Germany).
3. Food Science by Norman N. Potter and Joseph H. Hotchkiss (2007), CBS Publishers & Distributors Pvt. Ltd. New Delhi
4. Food Process Engineering (Theory and Laboratory Experiments) by Shri K. Sharma, S. J. Mulvaney and Syed S. H. Rizvi, Wiley- Interscience, A John Wiley & Sons, Inc., Publications.