Government Degree College (Autonomous), Baramulla

SEMESTER- 8th **MAJOR-III**

Subject: Food Science and Technology

Title: Food Engineering Code: FSTC3822M

CREDITS: (4 + 2) THEORY: 04 PRACTICAL: 02 CONTACT HOURS: 64T + 64L

Part-1 THEORY (4 CREDITS)

Course Objectives:

To provide the students with the basic knowledge of food engineering, the principles and the equipment involved.

Learning outcomes:

On completion of the course, the students shall be able to:

Understand the working of various equipment related to food engineering.

Put various equipment to practical use ensuring that safety measures are adhered to.

Unit – 1: Food engineering- principles and applications (16 HOURS)

Scope and importance of Food Engineering in the Food Industry.

Physical, thermal, rheological, and optical properties of food materials.

Rheology of foods: Newtonian and Non-Newtonian behavior, viscosity measurement, viscoelasticity.

Introduction to mechanical operations: size reduction, mixing, and conveying systems.

Unit – 2: Heat and mass transfer in food processing (16 HOURS)

Modes of heat transfer: Conduction, convection, and radiation. Fourier's law, Newton's law of cooling, overall heat transfer coefficient.

Principles of mass transfer: Diffusion, Fick's laws, moisture migration in food.

Thermal processing of foods: Pasteurization, sterilization, blanching, D-value, Z-value, and F-value concepts.

Heat exchangers: Types, working, and industrial applications.

Unit – 3: Unit operations and equipment (16 HOURS)

Evaporation: Types of evaporators, single and multiple effect evaporators.

Drying and Dehydration: Principles, drying rate curve, tray, spray, drum, freeze, and fluidized bed dryers.

Membrane processing: Microfiltration, ultrafiltration, nanofiltration, and reverse osmosis – principles and equipment.

Freezing and Refrigeration: Principles, types of freezers (plate, blast, cryogenic).

Unit – 4: Plant design, utilities and industrial management (16 HOURS)

Layout and design of food processing plants.

Utilities in food plants: Water, steam, air, etc.

Material handling and storage systems: Conveyors, elevators, silos, bins.

Safety, sanitation, and waste management in food industries.

Part- 2: Laboratory course (Credits: 02)

Demonstration and working of different dryers, evaporators, and freezers.
Demonstration of membrane filtration and concentration processes.
Demonstration of pasteurization, sterilization, and canning plant processes.
Demonstration of canning line.
Determination of physical properties of Food.
Visit to a food processing plant.

Books Recommended:

1. Introduction to Food Engineering by Singh, R.P. & Heldman, D.R. (5th Edition, Academic Press).
2. Food Processing Technology: Principles and Practice by Fellows, P. (4th Edition, Woodhead Publishing).
3. Fundamentals of Food Process Engineering by Toledo, R.T. (3rd Edition, Springer).
4. Unit Operations of Agricultural Processing by Sahay, K.M. & Singh, K.K. (2nd Edition, Vikas Publishing House).
5. Principles of Process Engineering in Agriculture by Henderson, S.M. & Perry, R.L. (1st Edition, ASAE).