

COURSE STRUCTURE OF M.SC. IN DAIRY TECHNOLOGY

Semester – I

S.NO.	Course Code	Course Title	L-T-P	Credits
1	DT -701	Milk and Milk Processing	2-0-2	3
2	DT – 703	Dairy Chemistry	2-0-2	3
3	DT - 705	Dairy Process Engineering	2-0-2	3
4	DT - 704	Dairy Microbiology	2-0-2	3
5	FST-703	Instrumentation and Analytical Techniques	2-0-2	3
6*	MAS-511	Statistical Methods	2-0-2	3
	MAS-815	Experimental Design	2-0-2	3

Semester –II

S.NO.	Course Code	Course Title	L-T-P	Credits
1	DT-702	Indigenous Milk Products and Dairy By-products	2-0-2	3
2	DT-706	Technology of Fat Rich Dairy Products	2-0-2	3
3	DT-707	Technology of Cheese and Fermented Milk products	2-0-2	3
4	CSIT-701	Computer Orientation	2-0-2	3
5*	MAS-815	Experimental Design	2-0-2	3

Semester- III

S.NO.	Course Code	Course Title	L-T-P	Credits
1	DT 801	Dairy Plant Management	2-0-2	3
2	DT 802	Technology of Frozen Dairy Products	2-0-2	3
3	DT-803	Technology of Condensed and Dried Milks	2-0-2	3
4	DT 804	Quality Control in Dairy Industry	2-0-2	3
5	DT 880	Seminar	0-0-2	1

SEMESTER - IV

S.NO.	Course Code	Course Title	L-T-P	Credits
1	DT- 899	Dissertation	0-0-60	30

*Optional subject

SYLLABUS OF MASTERS OF SCIENCE IN DAIRY TECHNOLOGY

SEMESTER- I

DT-701

Milk and Milk Processing

(2-0-2) 3 Cr.

THEORY

Market Milk Industry in India and abroad: Distinctive features of tropical dairying from those of temperate climate.

Collection and transportation of Milk: Identification of milk shed areas and planning procurement, Organization of milk collection routes.

Practices for collection of milk: Options for collection/preservation of milk at farm. Cooling, natural inhibitory substances in milk.

Lactoperidase system effect of milk quality.

Transportation methods and organization of raw milk transport.

Reception and preliminary testing of milk at plant.

Processing of market milk:

Practices for reception, chilling, clarification, and storage of raw milk.

Homogenization of milk: Definition, pretreatment of milk for homogenization, theories of homogenization, synchronization of homogenization with HTST plant. Effect of homogenization on physico-chemical properties of milk.

Bactofugation.

Thermal Processing of Milk:

Principles of thermal processing, kinetics of microbial destruction, thermal death curve, arrhenius equation. Terminology's used in thermal processing, 'D-value', 'Z-value', 'Q 10-value', 'Fo-value'.

Process description and definitions: Thermization, Pasteurization, Sterilization, UHT-processing.

Thermization: significance and methods.

Pasteurization methods: LTLT/HTST, uperization, stassinization.

Manufacture of special milks: Reconstituted/recombined milks, Flavoured milks, homogenized/ vitaminized milks. Lactose-hydrolysed milk.

UHT - Processing of Milk:

Relevance of UHT-processing

Description of UHT-plants-Direct, Indirect, Upstream and downstream homogenization, Third generation UHT plants.

Aseptic packaging: Types of packaging approaches for sterilization of packages, Filling systems. Shelf-life behaviour of UHT milk.

Quality assurance and technical control in UHT processing, design features, training of personnel, Plant hygiene, tests of UHT milk.

Nutritive value of heat processed fluid milks.

Plant operation efficiencies for market milk: Product accounting, setting up of norms for operational losses for fat and SNF, monitoring of operational efficiencies, Training of personnel, Maintaining plants hygiene.

Distribution system for heat processed milk.

PRACTICAL

1. Reception of milk at the plant
2. Pre-treatment of raw milk: Chilling, clarification, Filtration
3. Cream separation, standardization of milk.
4. Operational of TLT, HTST pasteurizer, sterilizer and UHT plants
5. CIP cleaning of storage tanks, cream separators, clarifiers, HTST plants etc.
6. Preparation of special milks, vitaminized, homogenized milks flavoured milk, toned, double toned sterilized, recombined milks, and Lactose-hydrolysed milk.
7. Homogenization efficiency of milk (USPH, curd tension)
8. Visit to market milk plant.

DT-703

DAIRY CHEMISTRY

(2-0-2) 3 Cr.

Detailed study of chemical and physical properties of milk, milk products, milk by-products, water and dairy waste Chemical and physical changes which occur in making each product. Water analysis water softening knowledge, its application in dairy operations of solutions, suspensions, emulsions, mixtures, pH, oxidation reduction potential, viscosity, surface tension, forming, freezing point, boiling point, super heating, super cooling, crystallization, coagulation, dessication. Legal standards for milk and milk products.

Fats , Fatty acids, saturated and unsaturated hydrogenation Physical and chemical properties of butter fat in milk and separately, triglycerides in butter fat. Effects on butter fat of enzymes, heat, acids, Phospholipids. Lipolysis, Nutritive value.

Proteins, amino acids, amides, ammonia, Lecithino proteins, physical and chemical properties of milk proteins in milk and separation, putrefaction, proteolysis. Effect on proteins of milk of enzyme heat, acid, alcohol Heat Coagulation point. Curd character casein, albumen, lactoglobulin, and nutritive value.

Carbohydrates: Physical and chemical properties of lactose in milk and commercial lactose Fermentation. Nutritive value.

Minerals: Physical and chemical properties of minerals in milk, hydrates, salt balance of milk and the effect on milk of acidenzymes, and heat. Effect on the mineral of milk of the various processes employed in the industrial preparation of milk and milk products.

Vitamins in milk, how they are affected by processing and storing milk and milk products, deterioration from other cases.

Enzymes in milk and their action in milk and milk products during processing and storage.

Effects of milk on metals and of metals on milk. Effect of light on milk. Chemical actions of detergents and sterilants on milk constituents.

Detailed study of the routine methods and special methods of chemical analysis used in the dairy industry for quality control and processing control. Equipment, apparatus, and chemicals required, laboratory requirements, costs.

DT-705

DAIRY PROCESS ENGINEERING

(2-0-2) 3 Cr.

Properties of Steam

Introduction, Formation of Steam, Total Heat (or Enthalpy) of Water, Latent Heat of Steam, Dryness Fraction, Wetness Fraction, Total Heat (or Enthalpy) of Wet Steam, Total Heat of Superheated Steam, Advantages of Superheating Steam Use of Steam Tables, Specific Volume of Steam, Volume of Superheated Steam, External Work Done during Evaporation, Internal Energy of Steam, Entropy of Waters, Entropy of Evaporation's Entropy of Wet Steam s_g , Entropy of Superheated Steam, Temperature Entropy Diagram for Water and Steam, Isothermal Lines on Temperature Entropy Diagram, Adiabatic Lines on the Temperature Entropy Diagram, Mollier Diagram or Total Heat Energy Chart for Steam, Methods of Heating and Expanding the Steam, Determination of Dryness Fraction of Steam. Type of Steam.

Boilers

Definition, Classification of Boilers, Comparison of Fire Tube and water, Tube Boilers, Essentials of a Good Boiler, Factors Affecting Boiler Selection, Simple Vertical Boiler, Fraser Culman Boiler, Cochran Boiler, Lancashire Boiler, Cornish Boiler, Locomotive Boiler, Nestler Oil Fired Boiler, Babcock and Wilcox Boiler, Stirling Boiler, High Pressure Boilers, The Benson Boiler, The Loeffler Steam Generator, The Volex Steam Generator, La Mont Boiler, Boiler Mountings, Boiler Accessories, Steam Driers or Separators, Steam Trap, Pressure Reducing Valve.

Performance of Boilers

Equivalent Evaporation, Factor of Evaporation, Boiler efficiency, Efficiency of Economizer, Boiler Horse Power, Heat Losses in a Boiler, Heat Balance Sheet of a

Boller, Methods of Minimising the Heat Loss through Different Sources, Boiler Draught, Natural Draught, Determination of the Height of Chimney, Determination of the Diameter of Chimney, Condition for Maximum Discharge through a Chimney, Efficiency of the Chimney, Artificial Draught, Steam jet Draught, Mechanical Draught.

Water treatment for boiler operation, Water Effluent treatment, Germicidal activity of chlorine, hypochlorites & Chloramines, General consideration in cleaning, Detergents for cleaning. Pollution Control, Natural cycles of waste decomposition, concept of BOD-Measurement. Kinetics of biological growth, kinetics of biological decay. Application of kinetics to biological treatment Reactor with recycles. Trickle filter model Design of an aerated tank without recycle Design of trickle filter system.

Introduction

Brief History of Refrigeration, Unit of Refrigerating Capacity, Thermodynamic State of a Pure Substance, Pressure-Temperature Diagram, Other Phase Diagrams Thermodynamic Systems and Energy Conservation Equations, The First Law of Thermodynamics, Steady Flow Energy Equation, Production of Low Temperatures, Expansion of a Liquid with Flashing, Reversible Adiabatic Expansion of a Gas, Irreversible Adiabatic Expansion (Throttling) of a Real Gas, Thermoelectric Cooling, Adiabatic Demagnetization.

Application of Second Law of Thermodynamics

The Second Law of Thermodynamics, A Refrigerating Machine - The Second Law Interpretation, Heat Engine, Heat Pump and Refrigerating Machine, Best Refrigeration Cycle.

Vapour Compression System.

Vapour Compression Cycle, Pressure Enthalpy Diagram and Calculations, Actual Vapour Compression Cycle.

Refrigerants.

Selection of a Refrigerant, Thermodynamic Requirements, Chemical Requirements, Physical Requirements, Refrigerant Piping and Design, Secondary Refrigerants, Using Mixed Refrigerants.

Refrigerant Compressors.

Types of Compressors, Thermodynamic Processes during Compression, Rotary Compressors, Screw Compressors, and Centrifugal Compressors.

Condensers.

Types of Condensers

Expansion Devices.

Types of Expansion Devices, Automatic or Constant-pressure Expansion Valve, Thermostatic-expansion Valves, Capillary Tube and its Sizing.

Evaporators.

Types of Evaporators

Gas Cycle Refrigeration

Limitations of Carnot Cycle with Gas as a Refrigerant.

Vapour Absorption System

Simple Vapour Absorption System, Common Refrigerant - absorbent systems, Lithium Bromide-water system.

Ejector-Compression System

Water as a Refrigerant, Steam Ejector System.

Load Calculation and Applied Psychrometrics

Preliminary Considerations, Internal Heat Gains, Occupancy Load, Lighting Load, Appliances Load, Piping, Tanks, Evaporation of Water from a Free Surface and Steam, Product Load, Process Load, System Heat Gains, Cooling-load Estimate, Heating-load Estimate, Psychrometric Calculations for Cooling.

Applications in Food Refrigeration Typical Examples of Food Processing by Refrigeration, Transport Refrigeration, Freezing of Foods, Types of Freezers, Refrigeration Load in Freezers, Calculation of Freezing Time, Freezing in Air, Freeze Drying.

DT-704

DAIRY MICROBIOLOGY

(2-0-2) 3 Cr.

THEORY

New Microorganisms associated with milk & milk products.

Hygienic milk production methods for milk preservation.

Microflora of raw milk. Effect of processing treatments on the microflora of raw milk.

Mastitic milk and its suitability for dairy processing.

Microbiology of market milk and milk products.

Starter culture technology.

Microbiological Quality Control of the Dairy Plant: The HACCP concept.

Sanitation of Dairy Plant equipment & environment.

Importance of microbiological quality of water.

Microbiological testing of milk & milk Products.

(Diseases transmitted via milk & milk products).

Microbiological standards recommended for milk & milk products.

Introduction to Aseptic Techniques.

PRACTICALS:

Apparatus used in Microbiological work.

Simple & Gram's staining.

Preparation of dilution blanks & media.

Sterilization of glasswares and media.

Microbiological analysis of water.

Microbiological analysis of milk & milk products.

Maintenance & propagation of starter cultures.

FST- 703

INSTRUMENTATION AND ANALYTICAL TECHNIQUES

2-0-2= 3

Unit – I

Preparation of Chemical solutions: Concept of molar, molal, and normal solutions, pH and Buffers; importance and measurement of pH.

Chromatographic Techniques: General principles. Partitions and adsorption chromatography. Paper, thin layer, gas liquid, ion exchange and affinity chromatography. Gel filtration. Introduction to high pressure liquid chromatography.

Unit- II

Electrophoretic Techniques: General principles. Paper and Gel Electrophoresis. Polyacrylamide Gel Electrophoresis.

Colorimetry: Beers and Lambert's law. General principles of Colorimeters and Spectrophotometers

Photometry: Spectrofluorometers.

Unit – III

Flame photometry: atomic absorption spectrophotometry

Carbohydrates: Qualitative and quantitative measures for reducing and non-reducing sugars, starch and fiber.

Fats: Physicochemical-extraction and separation procedures, quantitative measures for various lipids.

Unit – IV

Proteins: Physico-chemical properties, extraction and separation procedures, and quantitative measures for total proteins, amino acids and enzymes.

Vitamins: Colorimetric, Fluorimetric, Microbiological, Chromatographic and other methods for estimation of various vitamins.

Minerals: processing samples of analysis, colorimetric, spectroscopic and other methods for estimation of various minerals.

Unit – V

Total Quality Management in Food Industry (TQM), ISO certifications, Hazard Analysis and Critical Control Point (HACCP), Intellectual property Right and Patent

MAS 511

Statistical Method

(2-0-2) 3 Cr.

Definition and scope; Statistics.

Methods of condensation of data, frequency distribution Graphical representation

Measures of central tendency

Measures of dispersion

Moments, skewness and kurtosis.

Elementary notions of probability

Laws of addition and multiplication probability.

Theoretical frequency distributions

Binomial distributions and its applications

Poisson distribution and its applications

Normal distribution and its applications

Concept of sampling

Simple random sampling with replacement

Simple random sampling without replacement

Introduction to testing of hypotheses and Tests of Significance

'Z' and 'T' test for one sample problems

'Z' and 'T' test for two sample problems

'Chi-square' test for independence of attributes and goodness of fit. Simple correlation coefficient and its test of significance

Lines regression, Rank correlation

Practicals

1. Formation of frequency distribution and graphical representation.
2. Measures of central tendency.
3. Measures of dispersion.
4. Applications of 'Z' test for one and two sample problems
5. Applications of 't' test for one and two sample problems.
6. Applications of Chi-square test.
8. Rank correlation coefficient.

MAS-815

EXPERIMENTAL DESIGN

(2-0-2) 3 Cr.

Analysis of variance techniques, Definitions and assumptions, One way classification, two way classification with more than one observation per cell.

Designs of experiment, principles of experimental design, randomized block design (R.B.D), Latin square design (L.S.D.), Missing plot technique in R.B.D. and L.S.D., critical difference (C.D.), split plot design

Factorial experiment 2^2 , 2^2 , 3^2 , 3^3 , 2×3 , 2×4

Sampling techniques, simple random sampling, stratified random sampling and systematic sampling.

II SEMESTER

DT-702 Indigenous Milk Products & Dairy by-products (2-0-2) 3 Cr.

THEORY

Status of traditional milk products in India. Place of milk and milk products in the dietary regime in Indian population.

KHOA:

Classification of types, methods of manufacture, packaging and preservation.

Factors affecting yield of Khoa.

Physico-chemical changes during manufacture and storage of Khoa.

Mechanization in manufacture of Khoa.

Confections made from Khoa - Burfi, Peda, Lal Peda, Milk cake, Kalakand, Gulabjamun, compositional profile, manufacture practices.

Nutritive value of Khoa and Khoa-based confections.

Rabri, Malai, Khurchan, Basundhi: Product identification, process description, factors affecting yield.

Reheological changes during manufacture.

CHHANA:

Product description, methods of manufacture, packaging and preservation.

Channa-based sweets.

Mechanization of manufacturing process.

Product description, methods of manufacture, packaging

PANEER:

Preparation and preservation.

Prospects for mechanization of paneer manufacturing/packaging process through innovative approaches and integration with newly emerging technologies.

Physico-chemical changes during manufacture and storage.

Nutritive value of paneer.

SRIKHAND:

Chakka - Product description, method of manufacture, small scale and Industrial, packaging and preservation aspects.

Srikhand - Product description, method of manufacture, small scale and industrial, packaging and preservation aspects.

Physico-chemical changes and quality assurance during manufacture and storage.

Process/Product innovation - spray dried from of Shrikhand.

KHEER AND PYSAM:

Product description, methods of manufacture, innovations in manufacturing/ packaging processes, interaction between milk and cereal constituents, rheological changes during manufacture and storage.

In-can sterilization of Kheer.

Cost of manufacture and storage of traditional milk products.

PRACTICAL

1. Preparation of Khoa from cow, buffalo, concentrated and dried milk.
2. Analysis of Khoa for total solids, moisture, fat, acidity.
3. Preparation of Kheer.
4. Preparation of Chhana from cow and buffalo milk and mixed milk.
5. Preparation of Paneer from cow and buffalo milk and mixed milk.
6. Proximate analysis of Khoa, Chhana and Paneer.
7. Preparation of misti dahi, chhaka and srikhand.
8. Preparation of Khoa, Chhana based sweets.
9. Field Trip.

DT-706

Technology of Fat Rich Dairy Products

(2-0-2) 3 Cr.

Theory

Status of fat rich dairy products in India and abroad.

Introduction to milk lipids - Definition and general composition of milk fat.

Cream:

Efficiency of cream separation and factors affecting it; control of fat concentration in cream

Receiving, grading, sampling and weighing of raw cream; neutralization, pasteurization and cooling of cream.

Preparation and properties of different types of cream; table cream, sterilized cream, whipped cream, plastic cream, frozen cream and cultured cream.

Preparation cream for butter making.

Butter:

Introduction to the butter-making process; theory of churning; Batch and continuous methods.

Technology of butter manufacture; over-run in butter; control of fat losses in butter-milk; packaging and storage; transportation; defects in butter; rehology of butter; uses of butter.

Butter - making equipment: Construction, operation, care and maintenance of cream separators, coolers and vacreator, factory butter-churn and continuous butter making machines.

Special butters and related products:

Manufacture, packaging, storage and properties of whey butter, flavoured butter, whipped butter, renovated butter/fractionated and poly-unsaturated milk fat products, vegetable oil-blended products and low-fat spreads. Manufacture, packaging, storage and characteristics of margarine of different types.

Ghee and Butter oil:

Methods of ghee making-batch and industrial processes, innovations in ghee production, procedure, packaging and preservation of ghee; utilization of substandard milk and old/stored butter in the manufacture of ghee.

Continuous process for the production of ghee.

Methods of manufacture, packaging, storage, distribution and uses of butter-oil.

Nutritional aspects of cream, butter, butter-milk, ghee and ghee residue. Health aspects of milk fat.

Technical control in butter industry: Factors affecting plant operations, efficiencies, losses of milk solids, methods of improving operational efficiency and product accounting.

DT-707 Technology of Cheese & Fermented Milk Products 2-0-2= 3 Credit

Origin and history of development of Cheese manufacture, status and scope in Dairy Industry.

Definition, standard and classification of Cheese.

Cheese, additives and preservatives.

Milk quality in relation to Cheese manufacture.

Treatment of milk for cheese making.

Role of starter culture in relation to cheese quality

Rennet preparation and properties.

Rennet substitutes.

Role of milk constituents and changes during ripening.

Action of rennet on milk in relation to cheese manufacture.

Manufacture of different varieties of Cheese: Cheddar, Gouda, Swiss, Mozzarella, Cottage, Pizza cheese etc.

Changes during manufacture and ripening of Cheddar Cheese.

Technical Control: Factors leading to losses during processing and handling of Cheese.

Manufacture of processed Cheese, Cheese spread and Processed Cheese foods.

Defects: their cause and prevention.

Packaging, storage and distribution of Cheese.

Recent advances in Cheese Industry: Mechanization and Automation. Acceleration of Cheese ripening.

Production and practice of fermented Foods: Yoghurt, Dahi, Lassi, Acidophilus Milk, Kefir, Koumiss, Cultured Butter-Milk.

PRACTICAL

1. Standardization , neutralization, pasteurization and cooling of cream.
2. Preparation of sterilized cream.
3. Preparation of cooking butter by the hand operated churn
4. Preparation of desi butter.
5. Manufacture of table butter using the power - driven churn
6. Preparation of Low-fat spread.
7. Preparation of ghee from cream and butter.
8. Plant Visit.
9. Familiarization with equipment, accessories, Cheese varieties and preparation of starter cultures.
10. Study of factors affecting rennet action in relation to curd characteristics
11. Study of factors affecting whey expulsion.
12. Manufacture of Cheddar Cheese from cow, buffalo milk and mixed milk.
13. Manufacture of Gouda Cheese.
14. Manufacture of Cottage Cheese.
15. Manufacture of Mozzarella Cheese (Cultured and direct acidified).
16. Manufacture of processed Cheese and Cheese spread.
17. Manufacture of Pizza Cheese.
18. Demonstration of Pizza making.
19. Preparation of different types of Yoghurt.
20. Preparation of Lassi, Dahi, cultured Butter-milk, acidophilus milk.
21. Field visit to Cheese Factory.

MAS-815

EXPERIMENTAL DESIGN

(2-0-2) 3 Cr.

Analysis of variance techniques, Definitions and assumptions, One way classification, two way classification with more than one observation per cell.

Designs of experiment, principles of experimental design, randomized block design (R.B.D), Latin square design (L.S.D.), Missing plot technique in R.B.D. and L.S.D., critical difference (C.D.), split plot design

Factorial experiment 2^2 , 2^2 , 3^2 , 3^3 , 2×3 , 2×4

Sampling techniques, simple random sampling, stratified random sampling and systematic sampling.

CSIT- 701

COMPUTER ORIENTATION

(2-0-2) 3 Cr.

1. Information Concepts.
2. Computer Basics
 - (a) Definition, characteristics & Application of Computers
 - (b) Computer Hardware, I/O/ Devices, memory, CPU

- (c) Software Concepts
- 3. Operating System
 - (a) DOS
 - (b) Windows
- 4. Application Software
 - (a) MS Word
 - (b) MS Excel
- 5. Computer Programming
 - (a) Algorithm & Flowchart
 - (b) Introduction to 'C' language
 - (i) *History*
 - (ii) *Input & Output Statements*
 - (iii) *Expression & Operators*
 - (iv) *Control Statements*
 - *Branching Statements (if, if- else, nested if)*
 - *Looping statements (While, do-while, for)*
 - (v) *Functions and Arrays*
- 6. Internet Concepts & Search Engine.
- 7. Application of Statistical package

Practical Test

- a. Demo session on computer & its components, I/O. devices, memory, CPU
- b. MS DOS:
 - Internal DOS Commands: md, cd, dir, time, del, type, edit, copy, exit, path, cpromptm rem, ren, ver.
 - External DOS Commands: Attrib, backup, chkdsk, diskcomp, discopy, doskey, format, label, xcopy, move, tree, undelete.
- c. Windows: Login, Desktop, Icons & Folders, taskbar, Changing desktop properties, My Computer, My network places, Recycle bin, My documents, Control Panel.
- d. Application Software:
 - MS WORD: Getting familiar with carious tool bars, tables and columns, mail merge.
 - MS Excel: Working with spreadsheets, mathematical & Statistical functions, Generating charts creating Macros.
- e. C- programming:
 - Programs illustrating use of printf() and scanf() statements
 - Practicing with decision making statements like IF, IF Else, nested IF, Else –if ladder, Switch, Goto.
 - Working with loops.
 - Illustration of Arrays.
 - Designing programs to demonstrate concepts of functions.
 - Internet: Webpage, website, browser, URL, Surfing, Searching, creating mail accounts.
 - A glance over statistical packages like SPSS, MATLAB etc.

III SEMESTER

DT-801 DAIRY PLANT MANAGEMENT (2-0-2) 3 Cr.

The Dairy Industry in India & elsewhere.
 Organising, developing & financing a Dairy business.
 Types of owner-ship, co-operative, corporation & Private Companies.
 Procurement of milk, cream & other dry stores.
 Methods of Pricing and payment programme, raw materials supplies, spare parts, utilities, labour & Plant Operational and Technical Mgt.
 Inventory control.
 Product losses & their control in Dairy plants.
 Selecting a Plant location, surveying Potential supply & Market area.
 Security of stores plants & equipments.
 Financial records and thesis Mgt.

DT- 802 Technology of Frozen Dairy Product (2-0-2) 3 Cr.

THEORY

1. Status of Ice Cream Industry
2. Classification of frozen dairy products.
3. Composition of ice cream, BIS and PFA standards for Ice cream. Calculation of Mixes.
Ice Cream ingredients, stabilisers and emulsifiers, flavouring and colouring materials.
4. mix processing, Ice cream freezers, packaging and handling of Ice cream.
5. Judging and grading of Ice cream.
6. Fruit Ice cream, Nut Ice cream, Kulfi preparation.
7. Frozen Yoghurt, characteristics and production.
8. Defects in frozed products, Prevention and remedies.
9. .

PRACTICAL

1. Selection of ingredients for Ice cream, calculation of mix preparation.
2. Preparation of Ice cream and Kulfi.
3. Preparation of Fruit Ice cream.
4. Preparation of Casata Ice cream.
5. Studies on the characteristics of stabiliers and emulsifiers.
6. Effect of homogenisation on the quality of Ice cream.

DT-803 TECHNOLOGY OF CONDENSED AND DRIED MILKS (2-0-2) 3 CR.

History, status and scope in India and abroad, Definition and legal standards: Condensed milk, sweetened condensed milk and evaporated milk., Manufacturing techniques;

a) Manufacture of evaporated milk including pilot sterilization test b) Manufacture of sweetened condensed milk c) Recombined sweetened condensed milk. Grading and quality of raw milk for condensed and evaporated milk, Physico-chemical changes taking place during manufacture of condensed milk, Heat stability of milk and condensed milk, Physico-chemical properties of condensed milk and role of stabilizers in the stability of condensed milk, Chemical defects in condensed milk, their causes and prevention., Microbiological qualities of condensed milks, preservative used in evaporated, condensed & dried milks, a) Type of microorganisms occurring in condensed milks b) Survival and growth of microorganisms during manufacture and storage.c) Microbiological standards, d) Type of spoilage and their prevention. Recent advances with reference to freeze concentration and membrane concentration, Dried Milks: History and status in India and abroad, Grading and quality of raw milk for dried milks, Manufacture of skim milk powder (SMP), whole milk powders and heat classified powders, Physico-chemical changes taking place during manufacture of dried milks, Physical properties of dried milks, Defects in dried milk during manufacture and storage, their causes and prevention, PFA, BIS and International Standards for dried milk, Manufacture of infant foods, malted milk foods and other formulated dried products, Microbiological quality of various dried milks including infant foods and Management of condensed and dried milk industry.

DT-804 QUALITY CONTROL IN DAIRY INDUSTRY (2-0-2) 3 Cr.

Importance of chemical quality control in dairy industry, setting up quality control laboratories and testing facilities, mobile testing laboratories.

Sampling procedures; labeling of samples for analysis; choice of analytical tests for milk and milk products for chemical analysis; instrumental methods of analysis.

Calibration of dairy glasswares including butyrometers, pipettes, burettes, hydrometers, lactometers and freezing point thermometer.

Preparation and standardization of reagents required in the analysis of milk and milk products.

Legislation on production, transport, processing and marketing of milk and milk products: application of PFA, agmark BIS, IDF, ISO, IPO and international sanitary regulations related to dairy products to the quality control of milk and milk products.

Dairy effluents and their recycling."Prediction of shelf-life behaviour and quality assurance in milk and milk products.

Selection of tests for microbiology analysis of milk and milk products and their interpretations:

Rapid methods of milk testing: Non culture methods.

Organizational aspects of microbiological quality of dairy products.

Role of various agencies in the formulation of standards and controlling quality of dairy products.

Various microbiological standards of BIS, PFA, ISO, CCDS for dairy products.

Quality of dairy water supplies and purifications procedure and waste disposal. Treatment and disposal and wastewater and effluent.

Dairy products borne infection and intoxications and public health significance.

Microbial toxins in dairy products and their significance in public health.

Detection and control measures.

Indicator organisms and their significance in dairy products:

Faecal and non-faecal coliform including faecal streptococci.

Total gram negative bacteria including salmonella and shiegella group.

Predictions of shelf life behaviour and quality assurance in UHT processed/sterilized milk and milk products.

Application of HACCP in dairy industry.

PRACTICALS

1. Calibration of dairy glasswares such as pipette, burette, volumetric flasks hydrometer, butyrometers.
2. Preparation and standardization of dairy reagents such as acids alkalies, $\text{Na}_2\text{S}_2\text{O}_3$, AgNO_3 , Fehlings, EDTA solutions etc.
3. Detection of adulterants, preservatives and neutralizers in milk and milk products.
4. Chemical analysis of permissible additives and used in milk and dairy products.
5. Chemical analysis of detergents and sanitizers.
6. Preparation and testing of Gerber H_2SO_4 used in fat determination.
7. Testing the amyl alcohol used for fat determination.
8. Bacteriological quality analysis of dairy water
 - (a) Total viable counts -spc
 - (b) Total coliform counts-MPN method
9. Detection and enumeration of Staphylococcus aureus in dairy products
10. Detection of faecal and non-faecal coliforms in Dairy products
11. Detection of total gram negative bacteria, salmonella and shigella groups in dairy products.

DT-880**SEMINAR****(0-0-2) 1 Cr.****IV SEMESTER****DT-899****Dissertation****(0-0-60) 30 Cr.**