

COURSE STRUCTURE OF M.TECH. IN DAIRY TECHNOLOGY

SEMESTER- I

S.NO.	Course Code	Course Title	L-T-P	Credits
1	MAS-701	Advanced Engineering Mathematics	3-1-0	4
2	MAS-815	Experimental Design	2-0-2	3
3	CSIT-702	Computer Programming	2-0-2	3
4	DT-809	Advances in Dairy Processing-I	2-0-2	3
5	DT- 814	Steam & Refrigeration Engineering	2-0-2	3

SEMESTER- II

S.NO.	Course Code	Course Title	L-T-P	Credits
1	DC-810	Advances in Dairy Chemistry	2-0-2	3
2	DM-810	Advances in Dairy Microbiology	2-0-2	3
3	DT-812	Advances in Dairy Processing-II	2-0-2	3
4	DT- 815	Dairy Process Equipment Design & Plant Layout	4-0-0	4
5	DT-817	Dairy Plant Instrumentation & Process Control	3-0-0	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-805	Quality Assurance in Dairy Industry	2-0-2	3
3	DT-813	Advances in Dairy Processing – III	2-0-2	3
4	FST-703	Instrumentation and analytical techniques	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

**SYLLABUS OF MASTERS OF TECHNOLOGY
IN DAIRY TECHNOLOGY**

I SEMESTER

MAS-701 ADVANCED ENGINEERING MATHEMATICS (3-1-2) 4 Credits

Gamma, Beta and Legendre's functions, Euler's equations, Lang-range equations, the Rix method, the Green's functions. Solzane Woirestrass theorem in finite products.

Laplace transforms, Inverse Laplace Transforms, and application to differential equations. Fourier series, Fourier transforms, Solution of non-linear algebraic and transcendental equation by Regula falsi method. Newton Raphson method.

Newton's forward and backward interpolation formula divided differences. Trapezoidal Rule, Simpson's $1/3$ rule, Numerical Solution of Ordinary differential equations by Runge Kutta Method, Picard's equations.

Practical:-

As per theoretical syllabus

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 $2^1, 2^2, 3^2, 3^3, 2 \times 3, 2 \times 4$

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

Practical:-

As per theoretical syllabus

1. Algorithms & Flow Charts
2. 'C' Programming
 - (i) Preliminaries
 - (ii) Constants & Variables
 - (iii) Arithmetic Expressions
 - (iv) Input – Output statements
 - (v) Control Statement
 - (vi) Looping Statements
 - (vii) Subscripted Variables
 - (viii) Elementary Format Specifications
 - (ix) Logical statements & Decision tables
 - (x) Functions & Subroutines
3. Computer oriented numerical methods
 - (a) Solution of Non- Linear Equation
 - (i) Bisection Method
 - (ii) Newton Method
 - (b) Numerical integration
 - (i) Trapezoidal Method
 - (ii) Simpson's 1/3 & 3/8 rule
 - (c) Curve Fitting
 - (i) Construction of forward, backward difference table
 - (ii) Interpolation
4. Application of statistical packages

Practical List

1. ***To find the largest among three numbers.***
2. To check whether a given string is a palindrome or not
3. To find factorial of a given number by iteration
4. To find whether the given integer is a prime number.
5. To find sum n terms of series: $a \cdot n^2/2! + n^3/3! - n^4/4! + \dots$
6. To find the sum and average of n integers using a linear array.
7. To read n umbers from the keyboard and display these numbers in the reverse order their entry.
8. To search a given number within a linear array.
9. To generate the fibbonacci series.
10. To find factorial of a given number using a function.
11. To deduce error involved in polynomial equation.
12. To find out the root of the Algebraic and Transendal equations using Bisection, regula-falsi, Newton Raphson and Iterative methods. Also give the rate of convergence of roots in tabular form for each these methods.
13. To implement Newton's forward and backward Interpolation formula
14. To implement gauss forward and backward, bessell's Sterling and Evertt's Interpolation formula

15. To implement Newton's Divided difference and Lang ranges Interpolation formula.
16. To implement numerical differentiations.
17. To implement Numerical integration using trapezoidal, simpson 1/3 and simpson 3/8 rule.
18. To implement least square method for curve fitting.

**DT-809 Advances in Dairy Processing- I
Theory**

2-0-2

3

- 1) **Preservation of raw milk**- Method of raw milk preservation- physical process, chemical methods, LP system of preservation of milk.
- 2) **Bactofugation / Bactotherm processes**
- 3) **Cream separation and cream production** - Gravity (Shallow pan method, Deep setting method, water dilution method), Thermal processing of cream, Cream products (Coffee cream, Table cream, Sweet cream, Sour cream, Clotted cream , Frozen cream, Whipped cream, Plastic cream, Synthetic cream, Sterilized cream, Cream powder)
- 4) **Cream Preservation**- UHT processing, In packaging sterilization, Freezing process
- 5) **Butter and Dairy spreads**-Processing of cream for butter making, Standardization of the cream for butter making, neutralization of cream, Ripening of cream, Theory of churning, Calculation of overrun in butter, Continuous process of butter making, ,Packaging of butter , Butter spreads. Butter oils
- 6) **Fortification of fat spreads**- fortification with omega-3 fatty acids, dietary fibres, vitamins and minerals, antioxidants, plant sterol, probiotics.
- 7) **Table spread** – Definition as per FSSAI, Classification (Milk fat spread, mixed fat spread, vegetable fat spread), Role of source of ingredients.
- 8) **Current trends in cleaning and sanitisation of dairy equipments .**
- 9) **Frozen dairy products**- Ice cream and kulfi - definition as per FSSAI, manufacturing methods.

Practicals-

- 1) To study the role of LP system extending the keeping quality of raw milk.
- 2) To study about the HTST and LTLT pasteurizer.
- 3) To study the processing of bactofugation.
- 4) To study about the two step homogeniser and calculation of efficiency of homogenization.
- 5) Dismantling and assembling of cream separator.
- 6) Neutralization of the cream for butter making.
- 7) To study about the advance CIP and SIP system of dairy and equipments.
- 8) Calculation of ice cream mix.
- 9) To prepare the kulfi.

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

4

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 Dryers or Separators, Steam Trap, Pressure Reducing Valve.

Performance of Boilers

Equivalent Evaporation, Factor of Evaporation, Boiler Efficiency, Efficiency of Economiser, Boiler Horse Power, Heat Losses in a Boiler, Heat Balance Sheet of a Boiler, 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. Trickling 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.

Multi pressure Systems

Cascade Systems

Refrigerant Compressors

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

Practical

1. To study of simple vertical boiler.
2. To study of package boiler.
3. Calculation of enthalpy of wet, dry and superheated steam.
4. To study of Mollier Diagram.
5. To study of simple vapour compression refrigeration system.
6. Plotting of Ph diagram on refrigeration chart.
7. Calculation of C.O.P in Simple VCR system using refrigeration table and chart.
8. To study of Vapour absorption refrigeration system.
9. Calculation of C.O.P in compound VCR using refrigeration table and chart.
10. To study of refrigerant compressor

II SEMESTER

DC- 810

ADVANCES IN DAIRY CHEMISTRY

2-0-2 = 3

Nomenclature of milk proteins; major milk proteins: caseins (acids and micellar), fractionation of casein; primary and secondary structure of different fractions; casein models; alpha-lactalbumin and beta-lactoglobulin-distribution, whey protein concentrates and their functional properties; minor milk proteins: proteose-peptone, non-protein nitrogen constituents, immunoglobulins, lactotransferrin (lactoferrin), lipoprotein and fat globule membrane proteins; milk enzymes: properties and their significance with particular reference to lipases;

Milk lipids: classification, gross composition and physical properties; neutral and polar lipids and their role in milk and milk products; fatty acids profile: composition, properties and factors affecting them; unsaponifiable matter: composition with special reference to sterols and fat soluble vitamins and carotenoids, chemistry, physiological functions and levels in milk.

Lactose: occurrence, isomers; molecular structure; physical properties:- crystalline habits; hydrate; lactose glass; equilibrium of different isomers in solution; solubility; density sweetness; chemical properties:- hydrolysis; pyrolysis; oxidation; reduction; degradation with strong bases; derivatives; dehydration and fragmentation browning reaction; oligosaccharides in milk.

Major and minor minerals; factors associated with variation in salt composition; partitioning of salt constituents and factors affecting it; effect of various treatments on salt equilibrium; protein mineral interactions; distribution and importance of trace elements in milk.

Water soluble vitamins: thiamin; riboflavin; niacin; pantothenic acid; pyridoxine; biotin; folacin and cyanocobalamin; molecular structure; levels in milk and milk products.

Chemistry and Metabolic functions of different milk products, compositions and properties of milk and milk products, Effect of processing on various constituents of milk in relation to physical, chemical and functional properties, chemical spoilage of milk; processing and waste treatments.

Instrumental measurements of colour, viscosity tenderness, specific gravity, size and size distribution, firmness, texture etc. of various milk products. Analysis of major constituents, such as moisture, fat, protein and carbohydrates of milk and milk products, pH and acidity measurements.

Practical

1. Study of sophisticated instruments used in dairy chemistry.
2. Sampling of milk and milk products for chemical analysis.
3. Determination of density and specific gravity of milk.
4. Determination of viscosity of milk using Ostwald viscometer.

5. Determination of surface tension of milk using Stalagmometer.
6. Determination of pH and titratable acidity of milk.
7. Determination of fat in milk by different methods.
8. Determination of total solids and solids not fat in milk.
9. Determination of lactose in milk.
10. Determination of ash in milk.

DM- 810

ADVANCES IN DAIRY MICROBIOLOGY

2-0-2 = 3 Credit

Theory

Microflora associated with milk and milk products and their importance. Food poisoning, food infection, emerging food borne pathogens associated with milk and other milk borne diseases.

Lactic Acid bacteria and food fermentations. Current status of metabolism of starter cultures. Novel starter preservation techniques. Quality control tests of starter culture.

Naturally occurring preservative systems in milk like LP system, Immunoglobulins, Lysozyme, Lactoferrin etc. Food grade bio-preservative. Bacteriocin of lactic acid bacteria, structure, functions, transport and mode of action. Application of bacteriocin in food bio preservation.

Bacteriological aspects of processing techniques like bactofugation,, thermisation, pasteurization, sterilization, boiling, UHT, Pulse field treatment and membrane filtration of milk. Types of spoilages of heat treated milk. Bacteriological grading of raw and heat treated milk.

Practical

1. Isolation and identification of common microflora in dairy products
2. Isolation and identification of pathogenic microbes from dairy products by using selection media
3. Preparation and propagation starters
4. Starter activity test
5. Testing of starters for contamination
6. Evaluation of antimicrobial activity of the lactic acid bacteria
7. Antibiotic susceptibility testing for the pathogens isolate led from dairy products
8. Isolation of bacteriocin producing LAB

Non thermal processing

Non thermal processing are novel technologies alternative to heat treatment which include Pulsed electric fields, high Pressure Processing, Ultra sonication, Pulsed Ultraviolet light and Cold Plasma.

Extrusion Technology

Extrusion combines several unit operations including mixing, cooling, kneading, shearing, shaping and forming. Classified as, Cold Extrusion and Hot Extrusion. Method of Construction includes Single or Twin screw Extruders. Operating conditions & Process of Extrusion.

Food Emulsions/Foams/Gels

Food emulsions: emulsifiers and their Functions in foods, milk foams and their applications form formations and Stability. Theory of gel formation: pectin Substances and Jellies.

Membrane Processing

Membrane filtration is mainly used for molecular separation, pressure driven four membrane processes namely Microfiltration (MF), Ultrafiltration (UF), Nanofiltration (NF) and Reverse Osmosis (RO). Common membrane configurations and membrane modules; various application of membrane filtration in Dairy Industries.

Rheology of Dairy Products

Introduction to rheology of foods: Definition of 'texture', 'rheology' and 'psychophysics'. Rheological and textural properties of selected Dairy products: Measurement modes and techniques; Effect of processing and additives (stabilizers and emulsifiers) on food product rheology; Relationship between instrumental and sensory data. Rheological classification of fluid foods; Non- Newtonian fluids; Mechanisms and relevant models for non –Newtonian flow; Effect of temperature on rheology.

Hurdle Technology

Hurdle Technology works by combining more than one approach as hurdles, the pathogens has to overcome to remain active. Principle hurdles used for food preservation High temperature (f) low Temperature (t) , Reduced Water activity (a_w) increased acidity (Ph), Reduced Redox Potential, Bio preservatives.

Fermented Dairy Products

Fermentation is natural way to keep foods fresh and safe thought shelf life. Numerous fermented dairy products exist which includes yoghurt, Kefir, Laban, lassi, Dahi. Uses of Probiotics, Prebiotics and Synbiotics.

Practical

1. Study of gel formation and Gel Stability of milk Protein.
2. Preparation of single and double emulsions.
3. To study the Texture Profile Analysis of different Dairy Products
4. Comparative assessment of different types of Viscometers, and their Merits and Limitations: Co-axial cylinders, Spindle- or Impeller-type viscometers, Cone-plate viscometer, Capillary viscometers, Falling-sphere viscometer, Vibratory viscometers, Extrusion viscometer, Orifice viscometer.
5. Manufacture of Probiotic fermented dairy products.
6. Collection and identification of Prebiotics additives from different source.
7. To study the application of RO and Ion Exchange Units in water Softening Plant.
8. To conduct and identify different extruded products sold in local market and visit to a manufacturing Unit.

DT -815 DAIRY PROCESS EQUIPMENT DESIGN & PLANT LAYOUT (4-0-0) 4 Credits

Dairy Equipment Design

Codes and regulation, materials of construction, design of pressure vessel, storage tank, milk coolers, pasteurizing plants, flavour treating equipment, evaporation systems - evaporator; milk dryers; spray dryer and roller dryer; ice cream freezers. Design of material handling system and equipment. Design and evaluation of packages and packaging systems; methods and equipment for packaging.

Dairy Plant Layout

Special features of dairy industry; site selection of equipment before designing a plant; estimation of services required, peak and critical loads, stand-by plants; important considerations in planning and layouts of equipment; controls, pipelines, conveyors and services etc. Preparation of sample layouts; selection of building materials, internal construction, grid structure, foundations, drains illumination, ventilation, installation procedures in dairy plants.

DT- 817 DAIRY PLANT INSTRUMENTATION & PROCESS CONTROL (3-0-0) 3 Credit

Principles of measurement of temperature, pressure, vacuum, flow rate, liquid level, emissivity, pH, refractive index, viscosity, surface tension, colour, humidity and moisture content. Methods

of measurement of textural parameters e.g. Hardness, gumminess, chewiness and cohesiveness. Chromatographic method of analysis of milk constituents.

Principles of feed back theory and process control. Process characteristics and controller characteristics. Automotive control of temperature, pressure, vacuum, flow rate, liquid level refractive index, consistency and humidity, stability analysis. Process control applications in dairy plants.

III SEMESTER

DT -811 DAIRY PLANT MANAGEMENT (2-0-2) 3 Credits

Process selection and optimization, process design cost analysis, profitability, alternative investments, replacements, optimization in process design and equipment design, organizational structure, job evaluation and incentives, preventive maintenance and servicing of equipment, safety engineering, plant sanitation, food legislation and safety requirements.

DT-805 QUALITY ASSURANCE IN DAIRY INDUSTRY (2-0-2) 3 Credits

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

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

Calibration of dairy glassware's 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 sensory 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.

Dairy Microbiology

Selection of tests for microbiological 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, CCFS for dairy products.

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

Dairy products borne infections and intoxications and of 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 shigella group.

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

Application of HACCP in dairy industry.

Practicals

Dairy Chemistry

1. Calibration of dairy glassware 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 , Fehling's, EDTA solutions etc.
3. Detection of adulterants, preservatives and neutralizers in milk and milk products.
4. Chemical analysis of permissible additives 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.

Dairy Microbiology

1. Evaluation of common sanitizing agents used in dairy plants by
 - (a) suspension
 - (b) capacity test.
2. Bacteriological quality analysis of dairy water (a) total viable counts - SPC
 - (b) total coliform counts - "MPN method"
3. Determination of BOD in dairy waste
4. Microbiological tests for dairy effluent
5. Detection and enumeration of *Staphylococcus aureus* in dairy products
6. Detection of staphylococcal toxin in dairy products.
7. Detection of faecal and non faecal coliform and faecal streptococci in dairy products.
8. Detection of total gram negative bacteria, salmonella and shigella groups in dairy products.
9. Quality evaluation by HACCP in the preparation of dairy products.

DT-813

ADVANCES IN DAIRY PROCESSING -

III

(2-0-2) 3 Credits

Theory

Functional Foods, Definition, classification of Functional Foods, Criteria for Functional Foods, Probiotics: Definition and characteristics,

Prebiotics: Definition and characteristics, Polyphenols: Definition and Classification, Bioavailability of Polyphenols, Health Benefits of Polyphenols, Influence of Polyphenols on Macronutrients and Minerals,

Food fortification, Necessity of Food Fortification, Advantages of Fortification, Limitations of Food Fortification , Methods of Fortification, Fortification of Fruit and Vegetable Products , Fortified Fruit and Vegetable Products , Fortification of Beverages

Food Biotechnology: Genetic Engineering Vinegar Production

Advances in dairy/ food packaging : Introduction, Types of Packaging, Packaging Components, Importance of Successful Package, Packaging Materials, Properties of Packaging materials, Aseptic Packaging , Vacuum and Inert Gas Packaging Manufacturing of Packaging Materials Glass Containers, Metal Cans/Open Top Cans, Plastic Materials, Form-Fill and Seal Equipment

Dairy By-products, Casein, Types of casein, Lactose, Whey protein concentrate

Condensing of milk, Types of condensed milk , Drying of milk, Types of Drying, Preparation of WMP & SMP

Practical:

- Preparation of functional foods
- Determination of antioxidant activity of functional ingredient,
- preparation of value added dairy products,
- Preparation of fortified food,
- Calculation of sugar ratio and sugar percent in sweetened condensed milk, Preparation of sweetened condensed milk from a given sample of buffalo milk
- Preparation of casein.
- Preparation of fortified whey beverage
- To Study about the operation of FFS machine

FST- 703

INSTRUMENTATION AND ANALYTICAL TECHNIQUES

2-0-2= 3

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.

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.

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.

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.

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

Practical List

1. General instructions to be followed while working in laboratory.
2. To get acquainted with the commonly used equipments and instruments used in laboratory..
3. Determination of molecular weight of unknown protein using SDS-PAGE.
4. Determination of absorption spectrum of Bovine Serum Albumin.
5. Determination of absorption spectrum for Methylene Blue Dye.
6. Determination of crude fat content by soxhlet method
7. Demonstration of RP-HPLC for quantification of lactoperoxidase from whey
8. Demonstration of GLC for determination of fatty acid composition of milk fat.
9. Preparation of phosphate buffer.
10. Determination of pH of a buffer.
11. Determination of protein content by formal titration method.
12. Estimation of ascorbic acid in milk by dye reduction method

DT-880 Seminar

(0-0-2)1 Cr.

IV SEMESTER

DT-899 Dissertation

(0-0-60) 30 Cr.