

# Mata Gujri College

An Autonomous College

**Sri Fatehgarh Sahib**

Affiliated to Punjabi University, Patiala

**Syllabus**

**For**

**Diploma in Dairy Science**

(One year course under Community College Scheme of UGC)



**Academic Session 2023-24**

**Diploma in Dairy Science-1 Year Programme**

Subjects and Distribution of Marks

**Semester-I**

<b>Paper code</b>	<b>Name of paper</b>	<b>External Marks</b>	<b>Internal Marks*</b>	<b>Total Marks</b>	<b>Credit Hours</b>
DS-101	Dairy Farm Practices	75	25	100	4
DS-102	Milk Procurement, Processing and Packaging	75	25	100	4
DS-103	Dairy Chemistry and Microbiology	75	25	100	4
DS-104	Traditional Dairy Products	75	25	100	3
DS-105	Dairy Plant Management	75	25	100	3
DS-106	Lab Course pertaining to theory paper DS-101			50	2
DS-107	Lab Course pertaining to theory paper DS-102			50	2
DS-108	Lab Course pertaining to theory paper DS-103			50	2
DS-109	Lab Course pertaining to theory paper DS-104			50	2
DS-110	Lab Course pertaining to theory paper DS-105			50	2
DS-111	Industrial Visit			50	2
	<b>Total</b>				<b>30</b>

\***Internal assessment (25 Marks):** MST (15 Marks), Assignment (5 Marks), Attendance (5 Marks),

**DS: Dairy Science**

## DS-101

### DAIRY FARM PRACTICES

Lectures to be delivered: 60 (Credits- 4)

Max Marks: 75

Pass Marks: 35%

**Course Objectives:** To acquaint the students about different types of indigenous breed of cattle and buffaloes as well as provide basic inputs about production, planning and management of dairy farm and development of clean milk production

**Course Outcomes:** At the end of course, the students will be able to:

1. Distinguish different breeds of cattle
2. Able to understand the nutritional requirements of animals
3. Find the reasons of different cattle diseases and their prevention methods
4. Work upon the modern approaches of shed and fodder management
5. Explore new methods in the milk production channel and feed resources of cattle
6. Understand reproduction cycle of dairy animals and to familiarize with different bio-techniques.
7. Introduce new practices for breeding, cleaning and hygiene

### **INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES**

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B. Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C shall carry ten questions of 1.5 marks each.

#### Unit-I

**Animal Breeds:** Livestock history in India, Demographic distribution of livestock and role in economy, importance in daily life, Breeds of livestock: Cattle, Buffalo, Goat

**Nutritional Requirement:** Care and attention for new born calf, colostrums: composition and nutritional significance, pregnant and lactating animals feeding frequency, mineral mixtures and silage, Dry matter intake.

**Diseases and Prevention:** Mastitis, Brucellosis, Thaleria, Anaplasma, Milk fever, Foot and Mouth disease, Common farm management practices including disinfection, Disease prevention and parasite control

#### Unit-II

**Shelter and Fodder Management:** Housing systems and herd establishment, Modern approaches for shed establishment, Water source, ventilation and lightning, Importance of grasslands and fodders in livestock production, seasonal variation in fodder management

**Milking practices:** Milk hormones, Milking types: Hand milking and automatic machine milking

**Breeding practices:** Semen Collection and preservation, Quality Evaluation, Artificial insemination

**Cleaning and Hygiene:** Livestock cleaning, Automated milking machine cleaning, cleaning agents and cleaning procedures, Dung disposal and utilization, Disposal of carcass

#### **Books Recommended**

1. A textbook of Animal Husbandry, G.C. Banerjee, 2015 Oxford & IBH Co. Pvt. Ltd.
2. Principles and practices of dairy farm management, Jagdish Prasad, 2017, Kalyani Publishers
3. A Textbook of Livestock Production Management, Gautam, V.N, Shraddha Shrivastava, Aavishkar Publishers

## DS-102

### MILK PROCUREMENT, PROCESSING AND PACKAGING

Lectures to be delivered: 60 (Credits- 4)

Max Marks: 75

Pass Marks: 35%

**Course Objectives:** Students will understand the various methods of collection and transportation of milk and also study hygiene and sanitation in dairy industry. Students will also know the processing and packaging materials and machineries for milk and milk products as well as practice on platform test.

**Course Outcome:** At the end of course, the students will be able to:

1. Know about the procurement procedures of milk
2. Perform various activities like collection, pricing, distribution and transportation of milk to chilling centers
3. Differentiate the sensory and physical properties of milk
4. Perform the various milk reception tests
5. Understand all the processing operations performed in dairy plant
6. Understand the importance of UHT and pasteurization process
7. Involve in Packaging of different milks and milk products
8. Meet the regulatory standards of milk and milk products

### **INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES**

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B. Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C shall carry ten questions of 1.5 marks each.

#### Unit -I

**Procurement of Milk:** Milk procurement procedure, milk procurement systems (direct, contractor, agent, and cooperative systems), Dairy Co-operative Societies (Amul, verka), milk collection centers (MCC), bulk milk cooler (BMC) transportation, issues in procurement, introduction to milk producer companies

**Reception and quality evaluation of raw milk:** Milk reception operations (unloading, weighing, sampling, grading and testing), Platform tests (sensory tests, reception dock lab tests, tests for adulterants and neutralizers, fat and SNF tests), Introduction to rapid quality assurance tests, Reichert Meissl (RM value)

**Preprocessing of milk:** Chilling and Storage of milk, Filtration, Clarification, Standardization (Pearson square method), reconstitution and recombination

#### Unit-II

**Cream Separator and homogenizer:** Principle of cream separation, types of cream separators, properties of cream and skim milk, Principle of homogenization, factors influencing homogenization, stage-I and stage-II homogenization, homogenized milk

**Pasteurization and Sterilization of milk:** Definition and Operation, LTLT, HTST and Sterilization, Pasteurizers and heat exchangers (Plate & Tube), advantages and disadvantages, UHT processed milk.

**Packaging Material and Filling Machine:** Selection of packaging material and characteristics of packaging materials: paper (paper board, corrugated paper, fiber board), glass, metals, plastics, foils and laminates, retort pouches and package forms. Packaging techniques: vacuum packaging, modified

atmosphere packaging (MAP) and Eco-friendly packaging. Mechanized operation for FFS (Form fill and seal machine), bottle filling and pouch filling machine

**Labelling of dairy products:** Brand name, manufactured by and marketed by address, shelf life (expiry, best before, use by), compositions and nutritive value, ingredients, veg/non veg marks, fortification mark, net weight

**Regulatory standards:** FSSAI standards of market milk (toned, double-toned, standardized and full cream milk), cow milk, buffalo milk, goat milk, sheep milk and camel milk

### **Books Recommended**

1. Dairy Science and Technology, Walstra, P. (2005) CRC Press
2. Dairy Technology: Vol.1: Milk and Milk Processing, Shivashraya Singh (2014) NIPA
3. Market Milk, LathaSabikhi, Y. Kotilinga. (2016) AgriMoon.Com

## DS-103

### Dairy Chemistry and Microbiology

Lectures to be delivered: 60 (Credits- 4)

Max Marks: 75

Pass Marks: 35%

**Course objectives:** Course will throw light on detailed description of important genera of microorganisms associated with dairy, the students will be able to understand their characteristics and role of microbes in fermentation, spoilage and food borne diseases. They will also understand the concept of chemistry in milk and milk products.

**Course outcomes:** At the end of course; the students will be able to:

1. Understand the various physical and chemical properties of milk
2. Learn various methods to analysis of proximate composition of milk
3. Describe the various microbes associated with milk and understand the merits and demerits of microbes in field of dairy
4. Perform the various tests for estimation of microbes such as gram staining

#### **INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES**

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B. Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C shall carry ten questions of 1.5 marks each.

#### **Unit-1**

**Introduction and Definition:** Milk definition, Factors affecting the composition of milk, physico-chemical properties of milk (pH, acidity, COB, alcohol test, fat, SNF, specific gravity, density and Viscosity), Nutritional significance of milk, Lactose intolerance

**Milk proteins:** Casein: composition, Isoelectric point of casein, Whey proteins: Preparation of total whey proteins,  $\alpha$ -Lactalbumin and  $\beta$ -Lactoglobulin, Properties of milk protein

**Milk carbohydrates and lipids:** Definition and importance, Physical and chemical properties of lactose, General Composition and classification: Nomenclature and general structure of triglycerides, factors affecting fatty acid composition of milk, milk phospholipids and their role in milk products

**Other components of milk:** Vitamins and minerals of milk, Milk enzymes (alkaline phosphatase and lipase)

#### **Unit -II**

**Milk Microbiology:** Microbes associated with milk, their effects, Bacterial cell structure, Gram staining principles, spoilage, pathogenic microorganisms

**Probiotics:** Introduction to starter culture, Probiotic microorganisms and beneficial effects

**Milk Spoilage:** Indicator microorganisms for milk spoilage, Intrinsic and extrinsic factors affecting milk quality, harmful micro-organisms, Changes during milk spoilage, Milk borne diseases and milk borne intoxication

#### **Books Recommended**

1. Textbook of Dairy Chemistry, Mathur, (M.P, 2008) Indian Council Agriculture
2. Textbook of Dairy Microbiology: Dr J B prajapat and Dr PV Behare, (2018) ICAR New Delhi
3. Dairy science part-I Dr. Jagjivan Singh, Lovepreet Kaur, (2018)

## DS-104

### Traditional Dairy Products

Lectures to be delivered: 45 (Credits- 3)

Max Marks: 75

Pass Marks: 35%

**Course objectives:** To provide students in depth knowledge on status and significance of traditional Indian milk products as well as life of the methods of preparation and enhancement of shelf life of the prepared products by preservation methods.

**Course outcomes:** at the end of course, the students will be able to:

1. Able to prepare a great assortment of dairy products such as khoa, burfi, peda, kalakand, milk cake, gulabjamun, sandesh, rasgolla, chhach, Chakka, Shrikhand and Misti Dahi.
2. Explain the standard methods of manufacture of different dairy based products
3. Explain the advances in preservation and packaging of products.

#### **INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES**

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B.

Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C shall carry ten questions of 1.5 marks each.

#### **Unit-I**

**Introduction:** History and developments in traditional dairy products, Status and significance of traditional milk products in India

**Heat Desiccated Products:** Khoa and its classification, standards methods of manufacture and preservation, Continuous Scrapped Khoa making machine, factors affecting yield of khoa

**Khoa based Sweets:** manufacturing and proximate composition of Burfi, Peda, Milkcake, Kalakand and Gulabjaman

**Fermented dairy products:** Preparation of Dahi, lassi, chhach, Chakka, Shrikhand and Misti Dahi

#### **Unit-II**

**Acid Coagulated Products: Channa:** Product description, standards method of manufacture, packaging and preservation. **Paneer:** Definition, preparation method and yield

**Channa-based sweets:** Manufacturing process of Rasogolla, Sandesh and Rasmalai, advances in preservation and packaging

**Miscellaneous dairy products:** Manufacturing procedure of Ghee, and sweetened products (Chamcham, Pinni)

**Regulatory standards:** FSSAI standards of khoa, dahi, shrikhand, channa, paneer and ghee

#### **Books Recommended**

1. Outlines of Dairy Technology, De Sukumar, (2001), Oxford Univ. Press, ND
2. Advances in Indigenous Dairy Products, Pandey and Rajindera Kumar, (2013) Astral Publisher
3. Dairy Product Technology: Recent Advances, Hati, Subrota and Mondal, (2016), Astral Publisher

## DS-105

### Dairy Plant Management

Lectures to be delivered: 45 (Credits- 3)

Max Marks: 75

Pass Marks: 35%

**Course objectives:** Students will understand production management. They will also get the knowledge about plant operation and human resource management as well as about safety hazards, prevention and breakdown maintenance and food hygiene.

**Course Outcomes:** at the end of course, the students will be able to

1. Able to define management, production planning and control
2. Learning about energy conservation, auditing, financial and managerial efficiency
3. Know about safety hazards, prevention and breakdown maintenance and food hygiene.

#### **INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES**

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B. Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C shall carry ten questions of 1.5 marks each.

#### **UNIT-I**

**Plant layout Production Management:** Plant size and type, allocation of different sections. Definition, Objective and scope of plant Production Management, Production planning & Control, Functional management, Heierarchy of management

**Personal Management:** Definition and concept, Manpower planning, Recruitment, Training, Transfer, Promotions policies, Job specifications, Job evaluation, Job enhancement, Job enrichment, retirement and retrenchment

**Plant Maintenance and management:** Concept of Plant management, Need for plant maintenance, Maintenance procedure for plant machinery, prevention and breakdown maintenance, inventory tools (spare parts, tools, lubricants), safety and precautions, good manufacturing practices(GMP) and good lab practices(GLP).

#### **UNIT-II**

**Dairy Pollution Management:** Introduction to dairy effluent, types, disposal of dairy effluent and their treatment, BOD and COD, HACCP for dairy pollution management

**Documentation and record:** Need for documentation, process of documentation, Documentation record of production plan, process parameters and finished products, Record and responsibilities of quality control and quality assurance unit, concept of management information systems

**Sanitation and Hygiene of dairy plant:** Importance of hygiene, personnel hygiene, plant hygiene, ,Cleaning and Sanitation – different type of cleaning and sanitizing agents, methods of cleaning including CIP

#### **Books Recommended**

1. Dairy plant management, D B Puranik, (2013) NIPA Publisher
2. Dairy Plant Design & Layout, Sunil M. Patel & A.G. Bhadania Agrimoon
3. Dairy Farm business management, Rao, P venkateshwara, (2017) ASTRAL Publisher



## DS-106

### Lab Course pertaining to theory paper DS-101

Max Marks: 50      Pass Marks: 35% Lectures to be delivered: 30 (Credits- 2)

**Course Objectives:** In this lab course students will learn about all the farm practices practically which they already studied in the theory paper DS-101. This practical subject will enhance their practical knowledge and also encourage them to implement all the techniques and methods of theoretical paper practically.

**Course outcomes:** At the end of the course, the students will be able to

1. Identify various breeds of cattle and buffalo
2. Perform common dairy farm practices
3. Identify the diseases of dairy animals
4. Perform sanitation and hygiene practices in dairy farm
5. Perform artificial insemination and milking practices
6. Identify feed and fodder requirement as per animal health

### INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The Final practical paper will consist of three sections A, B and C. Section A comprises of write up (10 Marks) from the list of practical pertaining to lab course. Section B comprises of practical performance in examination (25 Marks). Section C comprises practical note Book Evaluation and Viva Voce of 5 and 10 Marks respectively.

1. Dairy farm visits to create awareness of trainees about ongoing forage, rearing, breeding practices
2. Identification of various breeds of buffalo and cow
3. Introduction to dairy farm shelters and its requirements
4. Demonstration of artificial insemination by veterinary expert
5. Identification of Common feeds and Fodders
6. Introduction to common cattle diseases, their symptoms and prevention
7. Demonstration to milking practices
8. Perform cleaning and sanitizing of dairy equipments
9. Detection methods of mastitic milk
10. Visit to veterinary institute for brief knowledge about dairy animals
11. Visit to GADVASU(Dairy farm and dairy plant)

## DS-107

### Lab Course pertaining to theory paper DS-102

Max Marks: 50

Pass Marks: 35%

Lectures to be delivered: 30 (Credits- 2)

**Course Objectives:** In this lab course students will learn about all the milk procurement procedures, its processing and packaging of the milk and milk products which they already learnt in the theory paper DS-102. This practical paper will enhance their practical knowledge about milk processing and also encourage them to implement all the techniques and methods of theoretical paper practically

**Course Outcome:** At the end of course, the students will be able to:

1. Know about the procurement procedures of milk
2. Perform the various milk reception tests
3. Prepare all the chemical solutions used in milk testing
4. Calculate all the parameters of milk as per its composition
5. Perform standardization of milk
6. Differentiate Packaging materials of different milks and milk products
7. Perform adulteration tests of milk to check its quality

### INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The Final practical paper will consist of three sections A, B and C. Section A comprises of write up (10 Marks) from the list of practical pertaining to lab course. Section B comprises of practical performance in examination (25 Marks). Section C comprises practical note Book Evaluation and Viva Voce of 5 and 10 Marks respectively.

1. Demonstration to procurement procedures of milk at village level milk societies
2. Demonstration for calibration of glassware
3. Standardization of chemical solutions
4. Lab scale demonstration for sampling of milk and various tests performed at reception dock
5. Separation of cream using cream separator
6. Determination of Fat and MSNF (Milk solids not fat) for given milk sample
7. Standardization of milk by Pearson square method
8. Preparation of different types of market milk (toned, double toned, standardization and full cream milk)
9. To study the different characteristics of various packaging materials used in dairy industry
10. Determining the efficiency of pasteurization of milk using alkaline phosphatase test
11. To check adulterations in different milk samples

## DS-108

### Lab Course pertaining to theory paper DS-103

Max Marks: 50

Pass Marks: 35%

Lectures to be delivered: 30 (Credits- 2)

**Course Objectives:** In this lab course students will learn about the milk composition, its chemistry and microbiological analysis in practical view point. It is a lab course pertaining to theory paper DS-103. This practical paper will enhance their practical knowledge about milk chemistry and milk microbiology in terms of microbes associated with it and the various tests performed for same.

**Course outcomes:** At the end of course; the students will be able to:

1. Understand the various physical and chemical properties of milk
2. Learn various methods to analysis of proximate composition of milk
3. Perform the tests for microbiological stability of milk
4. Identify various microbes associated with milk
5. Perform the various tests for physical properties of milk

### INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The Final practical paper will consist of three sections A, B and C. Section A comprises of write up (10 Marks) from the list of practical pertaining to lab course. Section B comprises of practical performance in examination (25 Marks). Section C comprises practical note Book Evaluation and Viva Voce of 5 and 10 Marks respectively.

1. Determination of Moisture, ash and total solid content in given sample of milk.
2. Perform various platform tests of milk
3. Perform Gram's staining of given culture
4. Total plate count of raw and pasteurized milk
5. *E.coli* confirmation test in given milk sample
6. Qualitative assessment of market milk sample through adulteration tests
7. To perform RM value (Reichert Meissl) test for milk
8. Qualitative assessment of given milk by MBRT test
9. Determination of density and specific gravity of milk
10. Determination of viscosity of given milk sample using Ostwald viscometer
11. Demonstration of milk-o-tester for determining fat of milk
12. Visit to Experimental dairy and Model Dairy plant of GADVASU Ludhiana/ NDRI Karnal

## DS-109

### Lab Course pertaining to theory paper DS-104

Max Marks: 50

Pass Marks: 35%

Lectures to be delivered: 30 (Credits- 2)

**Course Objectives:** In this lab course students will learn about the various milk products, their composition, method of production and factor affecting during production. These all products will be prepared in lab as per their manufacturing process so that student will get practical knowledge of milk products preparation. It is a lab course pertaining to theory paper DS-104.

**Course outcomes:** At the end of course, the students will be able to:

1. Prepare a great assortment of dairy products such as khoa, burfi, peda, kalakand, milk cake, gulabjamun, sandesh, rasgolla, chhach, Chakka, Shrikhand and Misti Dahi.
2. Deal with the various problems associated in production methods
3. Preservation and packaging of milk products.
4. Meet the regulations and FSSAI standards of that milk product
5. Prepare milk products and maintain their quality

### INSTRUCTIONS FOR THE PAPER SETTERS / CANDIDATES

The Final practical paper will consist of three sections A, B and C. Section A comprises of write up (10 Marks) from the list of practical pertaining to lab course. Section B comprises of practical performance in examination (25 Marks). Section C comprises practical note Book Evaluation and Viva Voce of 5 and 10 Marks respectively.

1. Preparation of khoa
2. Preparation of burfi and peda
3. Preparation of gulabjamun
4. Preparation of dahi, lassi, chhacch and mistidahi
5. Preparation of chakka and shrikhand
6. Preparation of chhana and paneer
7. Preparation of rasogolla and sandesh
8. Preparation of ghee
9. Visit to any dairy industry manufacturing traditional dairy products

## DS-110

### Lab Course pertaining to theory paper DS-105

Max Marks: 50

Pass Marks: 35%

Lectures to be delivered: 30 (Credits- 2)

**Course Objectives:** In this lab course students will learn about the management of the whole dairy plant. It is a lab course pertaining to theory paper DS-105. Course deals with safety precautions, waste disposal, operational precautions and cleaning so that students will familiar with all the management aspects and get practical exposure.

**Course Outcomes:** At the end of course, the students will be able to

1. Deal with all management, production planning and control aspects of any industry
2. Identify the sources of waste production and take initiatives to control them
3. Perform various treatments for waste disposal
4. Work upon energy conservation, auditing, financial and managerial efficiency
5. Minimize hazards by proper implementation of HACCP plan

### INSTRUCTIONS FOR THE PAPER SETTERS / CANDIDATES

The Final practical paper will consist of three sections A, B and C. Section A comprises of write up (10 Marks) from the list of practical pertaining to lab course. Section B comprises of practical performance in examination (25 Marks). Section C comprises practical note Book Evaluation and Viva Voce of 5 and 10 Marks respectively.

1. Material loss identification in cheese section
2. Material loss identification in ghee and butter section
3. Identification of safety measures and precautions
4. Identification and uses of common lubricants
5. Study of Various treatments in waste disposal
6. Analysis of cleaning agents and sanitizers
7. Reports and records maintenance of dairy plant
8. Operational precautions in dairy plants
9. CIP cleaning
10. Study of HACCP

**Diploma in Dairy Science-1 Year Programme**

Subjects and Distribution of Marks

**Semester-II**

<b>Paper code</b>	<b>Name of paper</b>	<b>External Marks</b>	<b>Internal Marks*</b>	<b>Total Marks</b>	<b>Credit Hours</b>
DS-201	Milk Products Technology	75	25	100	4
DS-202	Dairy Operations, Equipments & Utilities	75	25	100	4
DS-203	Milk by-products	75	25	100	3
DS-204	Dairy Entrepreneurship and marketing	75	25	100	4
DS-205	Fundamentals of Computers	75	25	100	3
DS-206	Lab Course pertaining to theory paper DS-201			50	2
DS-207	Lab Course pertaining to theory paper DS-202			50	2
DS-208	Lab Course pertaining to theory paper DS-203			50	2
DS-209	Lab Course pertaining to theory paper DS-204			50	2
DS-210	Lab Course pertaining to theory paper DS-205			50	2
DS-211	Industrial Visit			50	2
	<b>Total</b>				<b>30</b>

\***Internal assessment (25 Marks):** MST (15 Marks), Assignment (5 Marks), Attendance (5 Marks),

**DS: Dairy Science**

## DS-201

### Milk Products Technology

Lectures to be delivered: 60 (Credits- 4)

Max Marks: 75

Pass Marks: 35%

**Course Objective:** The students will understand the use of technology in milk processing for the production of different milk products. They will also learn about various fat rich milk products such as cream, condensed milks, dried milks and dried milk products.

**Course outcomes:** at the end of course, students will be able to

1. Know the manufacturing process of fat rich dairy products
2. Learn about condensed milks and dried milks
3. Describe the use of technology for the production of various dairy products such as Cheese, Yoghurt and its types Kefir and Kumiss, Ice-cream, Rabri, basundi and kheer

### **INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES**

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B. Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C of question paper shall carry ten questions of 1.5 marks each.

#### Unit-I

**Fat rich dairy products:** Composition, manufacturing process, storage and defects of cream, types of cream, Butter, Butter oil

**Condensed Milks:** Introduction, sweetened condensed milk, unsweetened condensed milk, sweetened condensed skim milk, unsweetened condensed skim milk, standards and uses, physicochemical changes during condensing and evaporation in milk

**Dried Milks and dried milk products:** Introduction (definition, composition and importance), properties of dried milks, Standards, production method (Roller and spray drying), packaging, storage and defects dairy whiteners, dairy creamers

#### Unit-II

**Technology for Cheese Production:** Classification of cheese based on moisture and fat basis, role of rennet and starter cultures in cheese making, manufacture of different cheeses (Cheddar, Mozzarella and Processed)

**Technology for Fermented Products Preparation:** Production process, packaging, storage and common defects of Yoghurt and its types Kefir and Kumiss

**Technology for Frozen Desserts Preparation:** Definition (ice cream, frozen desserts), Ice-cream mix preparation, role of emulsifiers and stabilizers, ice-cream manufacturing methods

**Miscellaneous dairy products:** Method of preparation, yield, packaging and shelf life of Rabri, basundi and kheer

#### **Books Recommended**

1. Outlines of Dairy Technology, De Sukumar, (2001) Oxford Univ. Press, ND
2. Advances in Indigenous Dairy Products, Pandey and Rajindera Kumar, (2013) Astral Publisher
3. Dairy Product Technology: Recent Advances, Hati, Subrota and Mondal, (2016) Astral Publisher
4. Technology of Indian Dairy Products, Aneja, R.P, (2002) dairy India Yearbook

## DS-202

### Dairy Operations, Equipments and Utilities

Lectures to be delivered: 60 (Credits- 4)

Max Marks: 75

Pass Marks: 35%

**Course objectives:** The students will gain an understanding of dairy processing unit operations and production of dairy products as well as gain the ability to think critically about problems and issues in food processing.

**Course outcomes:** at the end of course, students will be able to

1. Learn processing and technologies of milk plant operation from milk to various finished products.
2. Know about dairy plant system such as water supply systems and waste water system
3. Deal with issues and problems comes under dairy operations

### **INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES**

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B. Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C of question paper shall carry ten questions of 1.5 marks each.

#### Unit-I

**Dairy Operations:** Different Operational layouts and processing schedules, Flow process for milk and sequential processing operations

**Processing Equipments:** Plate heat exchangers and tubular heat exchangers. Double jacketed insulated vats, storage tank and silos, raw milk chiller, Butter churning machine, working principles of Driers (Roller drier and spray drier), Homogenizer and Cream separator, Incubator

**Dairy plant systems:** water supply systems and waste water systems, electricity systems, Boilers and steam generation system, Refrigeration, type of refrigerants, vapor compression and refrigeration cycle, short term and long term storage of dairy products.

#### Unit-II

**Mechanization and production Equipments:** Equipments used in manufacturing of indigenous dairy products, Ice-cream and Cheese making equipments, packaging machines for milk & milk products

**Dairy plant Corrosion:** Types and prevention of corrosion, material used for plant utensils and containers, steps to reduce and cure corrosion

**ETP Section and Waste Management:** Effluent from different sections, treatment and standards of discharge, BOD and COD limits of dairy effluent

#### **Books Recommended**

1. DaiHati, Subrota and Mondal, 2016, Dairy Product Technology: Recent Advances, Astral Publisher
2. Mishra Birendra Kumar, 2016, Dairy and food processing industry, Astral
3. Outlines of Dairy Technology, De, Sukumar (2001), Oxford Univ. Press, ND



## DS-203

### Milk By-Products

Lectures to be delivered: 45 (Credits- 3)

Max Marks: 75

Pass Marks: 35%

**Course objectives:** the students will get depth knowledge about production of many consumer products results in by-products that contain a considerably large part of nutrients originating from input materials.

**Course outcomes:** at the end of course, students will be able to

1. Understand the concept of by products
2. Know the production method of various milk by products such as skim milk, whey and buttermilk powder
3. Learn the nutritional value of milk by products
4. Learning about FSSAI regulatory standards of by products

### **INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES**

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B. Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C of question paper shall carry ten questions of 1.5 marks each.

#### Unit-I

**Introduction of by products:** By products (definition, wastage and reuse), Environmental aspects of by products discharge

**Skim Milk:** Skim milk as by-product from cream, uses of skim milk (flavored skim milk)

**Paneer Whey:** Whey as by-product from paneer, Process flow sheet for production process, Nutritive value and utilization, uses in bakery

**Cheese whey processing:** Whey as by-product of cheese, Beverages from whey, whey powder, whey protein products (whey concentrates and isolates)

#### Unit-II

**Buttermilk:** Physico-chemical characteristics of buttermilk and its preservation  
Composition of butter milk, utilization of butter milk, butter milk powder

**Ghee residue:** introduction, definition, Composition and nutritional characteristics, flavoring and antioxidant properties, processing and utilization

**Caseinates:** Manufacture of sodium caseinates, Production of casein hydrolysates edible and industrial uses of casein

**Regulatory standards:** FSSAI standards of whey protein concentrate, whey protein isolates, Butter milk, Ghee residue, Caseinates

#### **Books Recommended:**

1. Outlines of Dairy Technology, De Sukumar, (2001) Oxford Univ. Press, ND
2. Dairy Processing: Improving quality, Smith J, (2003) Woodhead Publishing
3. Milk Processing Dairy Products Industries, Engineers India Research Instt (EIRI publication)

## DS-204

### Dairy Entrepreneurship and Marketing

Lectures to be delivered: 60(Credits- 4)

Max Marks: 75

Pass Marks: 35%

**Course objectives:**The students will get the knowledge about planning and development of enterprises for extending sustainable livelihoods for rural people and they are able to understand the different concepts and techniques of management in extension organizations.

**Course outcomes:** at the end of course, students will be able to

1. Identify the general and entrepreneurial behavior competencies
2. Use appropriate technology to ensure dairy products meet international quality standards
3. Optimize use of all kinds of input resources

#### **INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES**

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B. Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C of question paper shall carry ten questions of 1.5 marks each.

#### **Unit-I**

**Entrepreneurship and leadership:** Concept of entrepreneurship, opportunities in dairy sector in India. Small, medium and large-scale enterprises, Concept of leadership, Characteristics of good leader, Responsibilities of leader

**Development of business plan:** Objectives of business plan, elements of business plan, business profile, consultancy and business expenses

**Policies and Budgeting:** Dairy Expert – Technical, MSME and State govt. criteria for loan, subsidies, Managing and operating a small business

**Marketing management:** Fundamentals of marketing, market survey, concept in price and cost analysis, understanding consumers, 4Ps concept

#### **Unit-II**

**Total Quality Management:** Introduction and concept, cost and economics of quality, tools and techniques for analyzing the quality process

**ISO Certification:** ISO 9000:2008, ISO 14000:2004 & ISO 22000: 2005

**Standards and Legislations:** Milk and milk product standards and legislations of India, HACCP, BIS and FSSAI, Agmark, steps involved in registration for BIS, FSSAI, and Agmark etc., a brief introduction about BIS, FSSAI, Agmark license and their registration codes.

#### **Books Recommended**

1. Dairy plant management, D B Puranik, (2013) NIPA Publisher
2. Dairy Plant Design & Layout, Sunil M. Patel & A.G. Bhadania Agrimoon
3. Dairy Farm business management, Rao, P venkateshwara, (2017) ASTRAL Publisher

## DS-205

### Fundamentals of Computers

Lectures to be delivered: 45 (Credits- 3)

Max Marks: 75

Pass Marks: 35%

**Course objectives:** The students will get knowledge about the basic concepts of computer applications and internet.

**Course outcomes:** at the end of course, students will able to

1. Learn basic principles of using window operating system
2. Able to access the internet , worldwide web as well as use internet applications in dairy science
3. Able to find and evaluate information on the web

### INSTRUCTIONS FOR THE PAPER SETTERS/ CANDIDATES

Question paper shall be divided into 3 parts. Each question will carry equal marks from section A & B. Four questions shall be set from each section. Candidate will attempt two questions from each section of 15 marks. Section C of question paper shall carry ten questions of 1.5 marks each.

#### UNIT-I

**Computer:** Introduction, Functions and Classification of Computer, Overview of Software and Hardware, Input and Output devices, Computer Memories.

**Introduction to Operating System:** Functions, working with files and folders, understanding the control panel, Opening and exiting Windows application, Copying and moving information between windows.

**Internet and its Applications:** Web browser, email, World Wide Web, searching on the web, video conferencing, Application of computer in dairy science.

#### UNIT-II

**Office Automation:** Introduction, Today's office, need for office automation, its advantages, disadvantages and office automation tools.

**Word Processing:** Formatting Text, Pages, Lists, Tables, Mail Merge Web Designing

**Spreadsheets:** Worksheets, Formatting data, creating charts and graphs, using formulas and functions, macros, Pivot Table

**Presentation Tools:** Adding and formatting text, pictures, graphic objects, including charts, objects, formatting slides, notes, hand-outs, slideshows, using transitions, animations

**Internet and its Applications:** Web browser, email, World Wide Web, searching on the web, video conferencing.

#### TEXT BOOKS:

1. Anita Goel, Computer Fundamentals, Pearson.
2. P.K. Sinha and P. Sinha, Foundations of Computing, First Edition, BPB.
3. R.K.Chopra, "Office Organization and Management"

#### REFERENCES

1. V. Rajaraman, "Fundamentals of Computers", Prentice Hall of India.
2. B. Ram, "Computer Fundamentals", Wiley Publications.
3. Satish Jain, "Information Technology", BPB.

## DS-206

### Lab Course pertaining to theory paper DS-201

Max Marks: 50

Pass Marks: 35%

Lectures to be delivered: 30 (Credits- 2)

**Course Objective:** It is a lab course pertaining to theory paper DS-201 in which students already learned about various milk products processing and their manufacturing. This course objective is to get the practical knowledge of all that products at small scale in a lab and is to identify the main issues in production of such products.

**Course outcomes:** At the end of course, students will be able to

1. Manufacture khoa based and fat rich dairy products
2. Prepare fermented dairy products
3. Modernize the technology for the production of various dairy products such as Cheese, Yoghurt and its types
4. Identify the various process parameters of Kefir and Kumiss, Ice-cream, Rabri, basundi and kheer

### INSTRUCTIONS FOR THE PAPER SETTERS / CANDIDATES

The Final practical paper will consist of three sections A, B and C. Section A comprises of write up (10 Marks) from the list of practical pertaining to lab course. Section B comprises of practical performance in examination (25 Marks). Section C comprises practical note Book Evaluation and Viva Voce of 5 and 10 Marks respectively.

1. Process optimization for preparation of differently graded khoa (Pindi, Danedar and Dhap)
2. Preparation of any of fermented grade milk and evaluate it on sensory basis
3. Lab practice to prepare yoghurt
4. Preparation of ice cream
5. Lab trail for pinni preparation
6. Preparation of Shrikhand
7. Preparation of flavored milk
8. Preparation of mozzarella cheese
9. Effect of rennet on coagulation of milk
10. Visit to spray drying and roller drying plant in any milk industry

## DS-207

### Lab Course pertaining to theory paper DS-202

Max Marks: 50

Pass Marks: 35%

Lectures to be delivered: 30 (Credits- 2)

**Course objectives:** It is a Lab Course pertaining to theory paper DS-202 which involves various dairy operations and equipments used in dairy industry and how these can be utilize in processing. Main objective of this lab course is to enable the students to know about the working of dairy machinery and to use them in beneficial manner for production of dairy products

**Course outcomes:** At the end of course, students will be able to

1. Work with different dairy equipments and utilize it for beneficial use
2. Perform all the operations performed in dairy plants
3. Deal with all the dairy plant system such as water supply systems and waste water system
4. Deal with issues and problems comes under dairy operations

### INSTRUCTIONS FOR THE PAPER SETTERS / CANDIDATES

The Final practical paper will consist of three sections A, B and C. Section A comprises of write up (10 Marks) from the list of practical pertaining to lab course. Section B comprises of practical performance in examination (25 Marks). Section C comprises practical note Book Evaluation and Viva Voce of 5 and 10 Marks respectively.

- 1 Demonstration of various equipments used in dairy plant
2. To study the processing of raw milk to packaged milk
3. Demonstration to CIP of dairy plant
4. Demonstration to FFS Machine
5. Study the constructional features and operation of pasteurizer
6. To perform corrosion test of any dairy equipment
7. Demonstration of cream separator
8. Demonstrate refrigeration cycle
9. Determination of BOD/COD of milk industry effluent
10. Demonstration of homogenizer
- 11 Visit to any Milk plant nearby.

## DS-208

### Lab Course pertaining to theory paper DS-203

Max Marks: 50

Pass Marks: 35%

Lectures to be delivered: 30 (Credits- 2)

Pass Marks: 35%

**Course objectives:** Main objective of this course is to identify all the byproducts form during the dairy processing operations so that students will utilize all of these for beneficial purposes and to improve the economy of dairy plant. Besides this its practical knowledge enable the students in new product formation.

**Course outcomes:** At the end of course, students will be able to

1. Identify the milk by products in processing line
2. Manufacture new dairy products by using these by products
3. Enhance the nutritional value of other milk products by using these
4. Utilize by products in proper manner to boost up dairy plant economy

### INSTRUCTIONS FOR THE PAPER SETTERS / CANDIDATES

The Final practical paper will consist of three sections A, B and C. Section A comprises of write up (10 Marks) from the list of practical pertaining to lab course. Section B comprises of practical performance in examination (25 Marks). Section C meant for practical note Book Evaluation and Viva Voce of 5 and 10 Marks respectively.

1. Yield calculation of whey and paneer partitioning from differently concentrated citric acid
2. A lab practice to utilize ghee residue in any of sweetened recipe
3. Comparative yield evaluation of butter obtained from cream and curd churning
4. Preparation of flavoredLassi
5. Skimming for differently heated milk and its quantification
6. Preparation of flavored skim milk
7. Whey utilization as by-product under RTS beverage
8. Preparation of whey based beverages
9. Preparation of casein and sodium caseinates

## DS-209

### Lab Course pertaining to theory paper DS-204

Max Marks: 50

Pass Marks: 35%

Lectures to be delivered: 30 (Credits- 2)

**Course objectives:** This lab course enables the students to get involved in innovation so that they may become entrepreneurs. The main objective of this lab course is to get familiar with entrepreneurship, its goals, responsibilities, and work environment in daily life. Besides this, different types of licensing, loans, subsidies, and new product formation are the main objectives of this lab course.

**Course outcomes:** At the end of the course, students will be able to

1. Get entrepreneurial behavior and innovative approach
2. Prepare themselves to use appropriate technology in the dairy sector
3. Use all kinds of input resources for growth
4. Maintain all the operations systematically for the consistent growth of the industry

### INSTRUCTIONS FOR THE PAPER SETTERS / CANDIDATES

The final practical paper will consist of three sections A, B, and C. Section A comprises of write up (10 Marks) from the list of practicals pertaining to the lab course. Section B comprises of practical performance in examination (15 Marks). Section C comprises of practical note book evaluation and Viva Voce of 10 and 15 Marks respectively.

1. Design of food plant layout for dairy farm / Dairy Plant
2. Field visit to nearby dairy farm to get familiar with responsibilities of entrepreneur
3. FSSAI website demonstration (License application, Standards, Lab manuals and Complaint procedure)
4. Guest lectures by experts for ongoing loan and subsidies options (Central and State Government)
5. Cost estimation calculation for developed product
6. Demonstration to HACCP and hazard analysis in dairy plant
7. Field visits to various mega and mini dairy plants
8. Preparation of DPR (Detail Project Report): NDRI based Software approach
9. Identification of different market milks and its standards

## DS-210

### Lab Course pertaining to theory paper DS-205

Max Marks: 50

Pass Marks: 35%

Lectures to be delivered: 30 (Credits- 2)

**Course objectives:** This lab course is pertaining to theory paper DS-205 in which students already got knowledge of computers and its working and its uses. Main objective of this course to enable the students for use of computers in dairy sectors like in dairy operations and arrangement of all the data, use of internet and other computer tools to work smoothly in dairy sector.

**Course outcomes:** At the end of course, students will able to

1. Easily work in dairy sector by using basics of computers and its uses
2. Access the internet , worldwide web as well as use internet applications in dairy sector
3. Find and evaluate information on the web related to various operations performed in dairy plant
4. Use the different tools that will make the operations easier and smooth.

### INSTRUCTIONS FOR THE PAPER SETTERS / CANDIDATES

**The practical paper will consist of four exercises and the candidates will be required to attempt any three exercises.**

**The breakup of marks for the University Examination will be as under:**

**Viva-voce: 10**

**Exercises: 20**

**Lab Record: 20**

**Office Automation:** Introduction, Today's office, need for office automation, its advantages, disadvantages and office automation tools.

**Word Processing:** Formatting Text, Pages, Lists, Tables, Mail Merge, Web Designing

**Spreadsheets:** Worksheets, formatting data, creating charts and graphs, using formulas and functions, macros, Pivot Table

**Presentation Tools:** Adding and formatting text, pictures, graphic objects, including charts, objects, formatting slides, notes, hand-outs, slideshows, using transitions, animations

**Internet:** Using Internet, Browser, E-mail, Search Engines.