Savitribai Phule Pune University

Anekant Education Society's

TULJARAM CHATURCHAND COLLEGE, BARAMATI, DIST-PUNE – 413102

Syllabus

For

B. Voc.

(Dairy Technology)

Sponsored by

University Grant Commission

Under

National Skill Qualification Framework (NSQF)

To be implemented from

2020-21

Title of the Course: B. Voc. (Dairy Technology)
(To be implemented from Academic Year - 2020-2021)

Course structure:

- B.Voc. is three year course with three theory and three practical courses in each semester**.**
- Each theory course will be of four credits and each credit is of 15 periods
- Each practical course will be of six credits and each credit is of 15 periods
- Each period is of one clock hour.
- In each practical course there will be one visit to the relevant industry/ institute.
- In addition to the regular practicals based on the theory course, special emphasis will be on communications and soft skills development of the students.

Eligibility:

1) **First Year B.Voc. (Diploma):** A student who has passed the Higher Secondary School Certificate (10+2) in any stream or its equivalent examination
2) **Second Year B.Voc. (Advanced diploma):** Keeping terms of First Year of B. Voc. and if they fulfil the eligibility conditions.
3) **Third Year B.Voc. (Degree):** Student shall pass all First Year B. Voc. courses and satisfactorily keeping terms of Second Year of B. Voc.

Note: Admissions will be given as per the selection procedure / policies adopted by the college, in accordance with conditions laid down by the Savitribai Phule Pune University, Pune.

Examination Pattern:

Examination:

- **Pattern of Examination**
  i) Internal exam, Term end exam, Oral, Project, Presentation, GD, Viva voce
  ii.) Pattern of the question paper:
    i) 25% Objective Question
    II) 50% Short and Long Answer type question
    iii) 25% Problem based Case Study/long answer type
- **Theory Examination: -**
  i) Continuous Internal Assessment: 50 Marks (Unit Test I & II, Assignment-2 No., Attendance) for each course of programme.
  ii) Semester End Examination: 50 Marks on the basis of Answer Sheet Evaluation for each course
- **Practical Examination: -**
  i) Continuous Internal Assessment: 75 Marks (Visit Report, Journal, Viva Voce, Seminar/Presentation, Group Discussion and Attendance) for each course.
  ii) Semester End Examination: 75 Marks on the basis of Answer Sheet Evaluation with performance in practical examination which will be evaluated by external examiner for each course.

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Dairy Technology (B. Voc. Programme)

Sub. Code	Semester-I	Credits	Marks
	Theory (General Education Component)		
BDT-101	Dairy Development	04	100
BDT-102	Dairy Farm Management	04	100
BDT-103	Dairy Chemistry	04	100
	Practical (Skill component)		
BDT-1.1	Dairy Farm Management	06	150
BDT-1.2	Dairy Chemistry	06	150
BDT-1.3	Soft Skill Development	06	150
	Total	**30**	**750**
	Semester-II		
	Theory (General Education Component)		
BDT-201	Food Preservation Technology	04	100
BDT-202	Milk Processing Technology	04	100
BDT-203	Dairy Microbiology	04	100
	Practical (Skill component)		
BDT-2.1	Food Preservation Technology	06	150
BDT-2.2	Dairy Microbiology	06	150
BDT-2.3	Computer Application	06	150
	Total	**30**	**750**
	Total First Year	**60**	**1500**
Sub. Code	**Semester-III**	**Credits**	**Marks**
	Theory (General Education Component)		
BDT-301	Dairy Processing Equipments	04	100
BDT-302	Fermented Milk Products	04	100
BDT-303	Nutrition Science	04	100
	Practical		
BDT-3.1	Dairy Processing Equipments	06	150
BDT-3.2	Fermented Milk Products	06	150
BDT-3.3	Nutrition Science	06	150
	Total	**30**	**750**
	Semester-IV		
BDT-401	Dairy Engineering	04	150
BDT-402	Traditional Indian Dairy Products	04	150
BDT-403	Food Safety, Hygiene & Sanitation	04	150
	Practical (Skill Based Component)		
BDT-4.1	Dairy Engineering	06	150
BDT-4.2	Traditional Indian Dairy Products	06	150
BDT-4.3	Food Safety, Hygiene & Sanitation	06	150
	Total	**30**	**750**
	Total Second Year	**60**	**1500**

Sub. Code.	Semester-V	Credits	Marks
	Theory (General Education Component)		
BDT-501	Quality Assurance and Waste management	04	100
BDT-502	Fat Rich Milk Products	04	100
BDT-503	Dairy Technology	04	100
	Practical (Skill Based Component)		
BDT-5.1	Quality Assurance and Waste management	06	150
BDT-5.2	Fat Rich Milk Products	06	150
BDT-5.3	Project	06	150
	Total	**30**	**750**
	Semester-6		
BDT-601	Entrepreneurship Development	04	100
BDT-602	Dairy Plant Management	04	100
BDT-603	Packaging Technology	04	100
	Practical (Skill Based Component)		
BDT-6.1	In-Plant Training	06	150
BDT-6.2	Dairy Product Development	06	150
BDT-6.3	Packaging Technology	06	150
	Total	**30**	**750**
	Total Final Year	**60**	**1500**
	Total for three years	**180**	**4500**

Note:

- One compulsory visit to field/industry/institute for each practical papers in all semesters
- Report Submission and PPT presentation of visit report is mandatory
- Seminar Report preparation and PPT presentation mandatory for each theory papers.
- Group discussion/case study based on local/regional/national social economic aspects.

B. Voc. First Year **Paper No. BDT-101** **Semester I**

Dairy Development (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objective

- To acquaint with properties and role of various constituents in foods, interaction and changes during processing.
- To acquaint with importance of various foods and nutrients in human nutrition.
- To acquaint with different groups of micro-organisms associated with food, their activities, destruction and detection in food.

Unit-1:Dairy Development and Dairy Co-operatives in India: History of Dairy Development and Co-operative Society in India, National Dairy Development Board, National Dairy Research Institute, Military dairy farm, IDC, Dairy Co-operatives, Milk Grid, Operation Flood. **12 Periods**

Unit-2:Government Policies and Incentives: Schemes for Development of Dairying, Assistance to Cooperatives, Intensive Dairy Development Programme (IDDP), Incentive schemes for Farmers, youth and Entrepreneurs, Dairy/Poultry venture capital fund, Other Schemes for dairying **12 Periods**

Unit-3:Market Milk: Definition, Factors affecting composition of milk, Clean milk production, Judging and grading of milk, Flavor defects of milk their causes and prevention, Uses of milk **12 Periods**

Unit-4:Animal Husbandry Practices and Health Care: **12 Periods**

Introduction to animal husbandry, Digestive system of ruminants and measures of feed energy. Nutrients requirements for growth and milk production. Feeding standards, Structure and function of mammary system. Milk secretion and milk let-down.

12 Periods

Unit-5:Milk Procurement: Clean and Hygienic milk production, milk procurement from the rural milk producer and its transportation and modes of payment. **12 Periods**

References:

- Dairying in India, Khurody D. N. (1974) Asia Publishing House
- Cooperation Principles and Substance, Gokhale Institute of Politics, New Delhi
- Cooperatives in India, Mathur (1977) Sahitya Bhavan, Agra
- Dairy Management, Pandit Sunder Lal Sharma Institute of vocational guidance 1998

B. Voc. First Year **Paper No. BDT-102** **Semester I**

Dairy Farm Management (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- To know the need and importance of dairy farm.
- To study the milking techniques, feed management and farm waste management

Unit-1:Introduction to dairy farm management: Dairy farm management-introduction, definition, principles, skills in Dairy farming, future scope of dairy management, constraints in dairy farming. **12 Periods**

Unit-2:Introduction to Milking Techniques: Types of milking techniques-Hand and Machine, steps of milking, milking management, testing of machines, maintenances of machines, cleaning routine of machine in parlour. **12 Periods**

Unit-3:Feed Management: Basic principles of feed and fodder management, important feed ingredients, feed mixing, feeding management, cultivation of fodder and nutrition of different fodder, shelter requirement and housing of dairy animals **12 Periods**

Unit-4: Cattle Bread: Distinguishing characteristics of India and exotic breeds of dairy animals and their performance. Systems of breeding and methods of selection of dairy animals. General dairy farm practices - Identification, dehorning, castration, exercising, grooming, weighing. Common disease problem in dairy animals, their prevention and controls **12 Periods**

Unit-5:Dairy Management and Entrepreneurship: Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; SWOT analysis of Dairy **12 Periods**

References:

- Livestock and Poultry Production, (1982) Singh Harbans and Moore Earl N.
- Livestock Production Management, (1999)Sastry N.S.R Kalyani Publishers
- ICAR , Handbook of animal Husbandary (2002)

B. Voc. First Year **Paper No. BDT-103** **Semester I**

Dairy Chemistry (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- To understand the chemistry of milk and its products, composition, role of each component and their interactions.
- To understand preservatives and processing of milk.
- To study the adulteration in milk and milk products

Unit-1:Introduction to dairy chemistry: Definition and structure of milk, factors affecting composition of milk, Physico-chemical properties of milk Nutritive value of milk, colostrum, Coagulation of Milk with Heat, acid, enzymes and alcohol. **12 Periods**

Unit-2:Proteins: Nomenclature and classification of milk proteins, casein, α-Lactalbumin and β lactoglobulin, Immmunoglobulin and other minor milk proteins and non-proteins nitrogen constituents of milk, Hydrolysis and denaturation of milk proteins under different physical and chemical environments, Milk enzymes with special

reference to lipases, Xanthine Oxidase, phosphates, proteases and lactoperoxidase.

12 Periods

Unit-3:Carbohydrates: Carbohydrates and its classification, Milk carbohydrates their status and importance. Physical and chemical properties of lactose, processing related degradation of lactose **12 Periods**

Unit-4:Lipds: Definition, general composition and classification of milk lipids. Nomenclature and general structure of glycerides, Structure of FG, Chemistry of FGM, factors affecting the fatty acid composition. Milk phospholipids and their role in milk products, Rancidity and its control

12 Periods

Unit 5:Vitamins and Minerals: Unsaponifiable matter and fat soluble vitamins, Milk Salts: Mineral in milk (a) major mineral (b) Trace elements, physical equilibria among the milk salts and Milk contact surfaces and metallic contamination.

12 Periods

References:

- Principles of dairy chemistry (1959) Jenness R and Patton S. John Wiley's, USA
- Fundamentals of Dairy chemistry, (1979) Webb B.H.
- Test book of Dairy Chemistry (1999) ICAR

B. Voc. First Year **Paper No. BDT-1.1** **Semester I**

Dairy Farm Management (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 practical/Semester (4 Period each)**

Objectives:

- To know the need and importance of dairy farm.
- To study common practices carried out at a dairy farm.

1. Identification of different milk breeds of cattle, buffalo, goats and external anatomy of dairy animals 4P
2. Housing of animals and maintenance of hygienic conditions at farm 2P
3. Clean milk production 3P
4. Detection of starch in milk 1P
5. Detection of cane sugar in milk 2P
6. Detection of Glucose in milk 2P
7. Detection of Urea in milk 2P
8. Detection of Ammonium sulphate in milk 2P
9. Detection of Sodium carbonate or bicarbonate as a neutralizer in milk 2P
10. Field or farm visit 4P
11. Activity – Visit to farm (Identification of feed and fodder, their report, photograph collection on farm visit)

B. Voc. First Year **Paper No. BDT-1.2** **Semester I**

Dairy Chemistry (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 practical/Semester (4 Period Each)**

Objectives-

- To learn basic analysis methods used in dairy industry.

1. Preparation of Standard 0.1N Sodium Hydroxide Solution **2P**
2. Preparation of Standard 0.1N Hydrochloric Acid **2P**
3. Preparation of Gerber Acid for Determination of Fat in Milk **2P**
4. Sampling of Milk **1P**
5. Platform Test - (I) Colt – On – Boiling Test **1P**
6. Platform Test – (Ii) Alcohol Test **1P**
7. Platform Test – (Iii) Sediment Test **1P**
8. Determination of Fat in Milk by Gerber Method **2P**
9. Determination of Solid – not – Fat (SNF) in Milk **2P**
10. Determination of Total Solid (TS) in Milk **2P**
11. Specific Gravity of Milk **1P**
12. Determination of Titrable Acidity of Milk **2P**
13. Determination of pH of Milk **1P**
14. Resazurin Reduction Test **2P**
15. Methylene Blue Reduction (MBR) Test **2P**
16. Activity – Preparation of chemicals of different normality used for milk analysis

B. Voc. First Year **Paper No. BDT-1.3** **Semester I**

Soft Skill Development (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 practical/Semester (4 Period each)**

Objectives-

- To acquaint with communication skill of English language in corporate world.
- To know the writing skill of scientific report (Seminar/In-Plant training/Project Report) and other project proposals for finance

Unit 1 Fluency in Grammar Usage **4P**

1) Tenses
2) Verbs
3) Active & Passive Voice
4) Reported Speech
5) Prepositions
6) Conjunctions
7) Effective Sentence-Construction
8) Vocabulary

Unit 2 Fundamentals **4P**

1) Greeting and taking leave
2) Introducing yourself
3) Introducing people to one another
4) Making requests and asking for directions
5) Congratulating, expressing sympathy and offering condolence

6) Making suggestions and offering advice
7) Making and accepting an apology

Unit 3 Situational dialogues **4P**

Unit 4 Personality development **4P**

Unit 5 Interview and Group discussion **4P**

Unit 6 Writing and comprehension skills **4P**

1) Letter (Formal) and Email
2) Report
3) Summarizing reports, articles, editorials
4) Making an abstract
5) Review writing
6) Writing resume

Activity – (Square talks, back and back conversations, listening and writing)

B. Voc. First Year **Paper No. BDT-201** **Semester II**

Food Preservation Technology (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 24 practical/Semester (4 Period each)**

Objectives:

- To study methods of preservation of foods
- To study the natural and chemical preservatives i.e. Class I and Class II Preservatives

Unit-1: Introduction to preservation: Definition, Introduction to preservation, History of preservation, general principles of food preservation, Need & benefits of industrial food preservation **10 Periods**

Unit-2: Food Preservation by drying: Types of drying, changes during drying, effect of drying on food, advantaged and disadvantages of drying **15 Periods**

Unit-3: Food preservation by High & Low temperature: Preservation by high temperature: Blanching, pasteurization & Canning, Effect of heat on food and micro-organisms Preservation by low temperature: Chilling, Refrigeration & freezing Effect of low temperature on food & microorganisms **15 Periods**

Unit-4: Food preservation by irradiation: Introduction & units of irradiation, mechanism of action of radiation, radiation process, effect of radiation on food, effect of radiation on micro-organisms **10 Periods**

Unit-5: Food preservation by other methods: Definition of preservative, Types of preservatives - Class I & Class II, Carbonation, Antibiotics, Fermentation & Filtration **10 Periods**

References:

- Handbook of Food preservation (1999) M. Shafiur Rahman CRC Press
- Food Preservation techniques (2003) Peter Zeuthen
- The Technology of food preservation 4th Edition (2006) Norman W. Desroier

B. Voc. First Year **Paper No. BDT-202** **Semester II**

Milk Processing Technology (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- To study the methods of the collection and transportation of milk.
- To study hygiene and sanitation in dairy industry.
- To know the processing and packaging materials and machineries for milk and milk products.

Unit-1: Milk Reception: Milk Collection and Transportation, Milk Reception at the Dairy Dock, Milk Chilling and Storage **12 Periods**

Unit-2: Processing of milk: Clarification, Separation, Bactofugation and Standardization Pasteurization and Homogenization **12 Periods**

Unit-3: Sterilization and Ultra-High-Temperature Processing **12 Periods**

Definition, Theoretical basis types of sterilization plants, Description of the canning process, Quality of sterilized milk

Unit-4: UHT

Ultra-High temperature processing definition, Theoretical basis for UHT processing, Types of UHT sterilization plants, Changes in milk during processing, Aseptic packaging, types of sterilizing medium, Types of packaging materials, Description of aseptic packaging systems

Unit-5: Special Milks: Sterilized milk, Homogenized milk, Flavored milk, Toned milk, Double toned milk, Standardized milk, rehydrated milk, recombinant milk, UHT milk. **12 Periods**

References:

- Outlines of Dairy Technology, (1980) Sukumar De
- The technology of milk processing, (1991) Khan A.Q
- Manual for milk plant operations, (1957) Washington
- Food engineering and Dairy technology (1981) Kessler H.G.

B. Voc. Second Year **Paper No. BDT-203** **Semester II**

Dairy Microbiology (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- To Know the important genera of microorganisms associated with dairy and their characteristics
- To study the role of microbes in fermentation, spoilage and food borne diseases.

Unit 1:History & scope of Microbiology: Introduction to microbiology, Historical Contribution of various scientists, scope of microbiology in food, Types of cell – Prokaryotic & Eukaryotic cell, Introduction to various types of micro-organisms, Structure of bacteria **12 Periods**

Unit 2:Microbial growth in food: Factors affecting growth of micro-organisms, Growth curve, Sources of contamination, causes of spoilage, Food in relation to disease- food borne poisoning, infections and intoxications **12 Periods**

Unit-3:Culture media and Pure culture Techniques: Culture Media & its Composition, Types of culture media Methods for isolation of pure culture- Streak plate, Pour plate and Spread plate **12 Periods**

Unit 4:Microscopy and Staining Procedures: Introduction & types of microscope, Definition of dye & stains, classification of stains- Acidic, Basic and Neutral, principles, procedure, mechanism & applications of staining procedures: simple staining, negative staining, differential staining- gram staining & acid fast staining **12 Periods**

Unit-5:Beneficial microorganisms and Microbial spoilage: Beneficial microorganisms and Microbial spoilage of meat, poultry fish; fruits & vegetables; cereal & cereal products and milk & milk products. **12 Periods**

References:

- Food Microbiology (2013) William C Frazier
- Dairy Microbiology (2005) Richard K. Robinsons
- Dairy Microbiology : A Practical approach PhotisPapademas (2014)

B. Voc. Second Year **Paper No. BDT-2.1** **Semester II**

Food Preservation Technology (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 Practical/Semester (4 Period Each)**

Objectives-

- To study methods of preservation of foods
- To study the natural and chemical preservatives i. e. class I and class II preservatives

1. Study of class I and class II preservatives **3P**
2. Preservation by Salt (Pickle and fish) **2P**
3. Preservation by Sugar (Jam, Jelly) **2P**
4. Preservation by Oil (Vegetable pickle) **2P**
5. Preservation by Chemical preservative (Squash, Kechup) **2P**
6. Preservation by Low temperature (Chilling and freezing peas **3P**
7. Preservation by High temperature (Blanching, Pasteurization) Vegetables, Fruits, Milk **4P**

8. Preservation by Drying (Sun and mechanical) Spinach, Grapes **2P**
9. Preservation by Use of acidulants: Preparation of tomato products **2P**
10. Preservation by Osmotic dehydration **2P**
11. Activity – Which are preservatives used in food and prepare the list and write the uses

B. Voc. Second Year **Paper No. BDT-2.2** **Semester II**

Dairy Microbiology (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 Practical/Semester (4 Period Each)**

Objectives-

- To know basic microbiology laboratory practices and equipment
- To study the preparation of media, culture, identify micro organisms

1. Introduction to basic microbiology laboratory practices **2P**
2. Study of compound microscope **2P**
3. Study of instruments used in microbiology lab **2P**
4. Microbiological media preparations (Sabourds, Mac-Conkeys, Nutrient, Blood, Chocolate) **3P**
5. Gram staining **1P**
6. Monochrome staining **1P**
7. Cleaning and methods of sterilization **2P**
8. Cultivation and subculturing of microbes **2P**
9. Microbial sampling **1P**
10. Standard Plate Count method **2P**
11. Isolation of E. coli from food sample **2P**
12. Colony characterization **2P**
13. Industrial quality control lab visit **2P**
14. Activities – Study of swab test

Study the difference between fresh and spoiled food

B. Voc. First Year **Paper No. BDT-2.3** **Semester II**

Computer Application (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 Practical/Semester (4 Period Each)**

Objectives-

- To study the computer machine and operating system
- To study the different programmes for development of websites and designing of packaging labels.

1. **Introducing Computer and Operating system** **1P**
2. **MS-WORD** **2P**

3. **MS-EXCEL** **2P**
4. **MS-POWERPOINT** **2P**
5. **Introduction to the internet, search engine** **2P**
6. **E-Mails, Google Docs and Forms** **3P**
7. **Introduction to Pagemaker** **3P**
8. **Introduction to Corel Draw** **3P**
9. **Introduction to Photoshop** **2P**
10. **Web development: HTML and Scripting language** **2P**
11. **How to search research papers** **1P**
12. **How to convert word to PDF and vice-versa** **1P**
13. **Activity – Report preparation**

References*:*

1) Microsoft Office 2000 by Vipra Computers, Vipraprinterspvt. Ltd.
2) Advanced Maicrosoft Office 2000 by MeredithaFlynin, Nita Rukosky, BPB pub.
3) Teach yourself Windows
4) Fundaments of Computers - V. Rajaraman
5) Computer Fundamentals by P. K. Sinha &Priti Sinha, 4th edition, BPB, publication.

B. Voc. Second Year **Paper No. BDT-301** **Semester III**

Dairy Processing Equipments (Theory-General Education)

Maximum Marks: 100 **Credits: 4**
Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- **To understand type of materials used for making equipment in dairy industry.**
- **To know about maintenance of Equipments.**
- **To understand the design and working of pumps, and other processing Equipments.**

Unit-1 Materials and sanitary features of the dairy & food equipment, Sanitary pipes and fittings, Pumps: Types, working principle, care & maintenance, Cleaning & Sanitation in Dairy & Food equipment: Cleaning & Sanitizing Agents, Cleaning in Place (CIP)

Unit-2 Homogenizer: Single & Two stage, homogenizing valve. Sterilizer, Pouch &Bottle filling machine,Carbonation unit.

Unit-3 Description, working and maintenance of milk reception equipment: Tipping tank, Storage tank, Can washer, bottle washers, crate washer

Unit-4 Study of Dairy & Food processing equipment: Pasteurizer: batch, HTST, FDV, Centrifugal Cream Separator, and Clarifier.

Unit-5 Boilers & steam generation: Modes of heat transfer, thermal conductivity, specific heat, temperature measuring instruments,. Properties of steam: Wet, dry saturated,

superheated steam, Steam generators: Fire tube boilers, Water tube boilers. Boiler mountings and accessories

References:

- Dairy engineering Technology and engineering of Dairy Plant Operation- Anantkrishnan C.P. Simha N.N. (1987)
- Dairy Plant Engineering and Management (1990) Tufail Ahmad
- Food engineering and Dairy Technology- Kessler H.G. (1981)

B. Voc. Second Year Paper No. BDT-302 Semester III

Fermented Milk Products (Theory-General Education)

Maximum Marks: 100 Credits: 4

Teaching Period: 4 Theory Teaching Load: 60 Theory Period

Objectives-

- **To learn basics of fermentations, starter cultures, and fermenters**
- **To learn making process of various fermented products**
- **To learn Principles of cheese making**

Unit-1- Introduction to fermentation

Definition, Concept, Types of fermentation, Fermenter, Importance of fermentation, Starter culture and its classification , types and importance, Nutritional importance and need and benefit of fermented products.

Unit 2- Fermented Milks

Characteristics of fermented milk products, varieties of fermented milk products available in market Dahi, MishtiDahi, Lassi, Shrikhand, Yogurt,

Unit 3-Cheese

Starter cultures, Types of milk, Coagulants, Molds History, Definition, composition, classification, Principle and method of manufacture of cheddar cheese, Principle and method of manufacture of Mozzarella cheese, Principle and method of manufacture of Pasteurized processed cheese products.

Unit 4 –Butter

Definition, composition, nutritive value, Manufacturing, Theories of churning, Defects in butter and their causes and prevention

Unit-5 Processed cheese

Definition, composition, nutritive value, Manufacturing and types.

References:

1. Outlines of Dairy Technology, (1980) Sukumar De
2. Cultured milk products in CRC handbook (1982) Chandan R.C, Shahani K.K.
3. Yogurt Science and Technology (2004) Tamime A.Y. and Robinson R.K.

B. Voc. Second Year Paper No. BDT-303 Semester III

Nutrition Science (Theory-General Education)

Maximum Marks: 100 Credits: 4

Teaching Period: 4 Theory Teaching Load: 60 Theory Period

Objectives-

1. **To understand nutrients and food component that supply nourishment to the**

body.

2. **To know about the functions, deficiency and toxicity of nutrients**
3. **To understand malnutrition and its prevention**

Unit-1 Introduction to Nutrition Science, Food and Our Body and Recommended Dietary Allowances **12 Periods**

Unit-2 Food Constituents- Definition, Occurrence, Properties and metabolisms of Protein, Carbohydrates and lipids. **12 Periods**

Unit-3 Role of nutrients, Balance diet, Food exchange list and Principle of Meal Planning, Energy Balance- BMR, Recommended dietary allowances, Balanced diet for different age groups (infant to old age) **12 Periods**

Unit-4 Nutrition for Fitness and Sports, Therapeutic diets and effective nutritional counseling, Diet during Energy Imbalance and Diet for different diseases **12 Periods**

Unit-5 Malnutrition Causes, types, symptoms and presentation of Assessment of Nutrition status of the community National Nutritional Policy **12 Periods**

References:

1. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). *Textbook of Human Nutrition*, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd.
2. Srilakshmi (2007). *Food Science*, 4th Edition. New Age International Ltd. 29
3. Wardlaw MG, Paul M Insel Mosby (1996). Perspectives in Nutrition, Third Edition.
4. B. Srilakshmi (2007) Dietetics, Revised Fifth Edition, New Age International Publishers
5. B. Srilakshmi (2011) Nutrition Science, Third Edition, New Age International Publishers
6. Dr. M. Swaminathan (2006) Advanced Text book on Food and Nutrition, Volume 1 and 2, Second Edition, BAPPCO Publication.
7. Jim Mann and A. Stewart Truswell (2010) Essentials of Human Nutrition, Third Edition, Oxford Publication.
8. Michael J. Gibney, Hester H. Vorster and Frans J. Kok (2002) Introduction to Human Nutrition, First Indian Reprint, Blackwell Publishing.
9. Biochemistry of Foods-N.A.M Eskin, H.M. Henderson, R.J. Townsend.
10. Introduction to Biochemistry of Foods, Z. Berk

B. Voc. Second Year **Paper No. BDT-3.1** **Semester III**

Dairy Processing Equipments (Theory-General Education)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 Practical/Semester (4 Period Each)**

Objectives-

- To understand type of materials used for making equipment in dairy industry.
- To know about maintenance of equipments.
- To understand the design and working of pumps, and other processing equipments.

1. Study of sanitary pipes and fittings 3P
2. Study of sanitary milk pump 2P
3. Study of can washer 2P
4. Study of milk tanker, Storage tank & silos 2P
5. Study of cream separator 2P
6. Study of Milk homogenizer 2P
7. Study of different controls in HTST pasteurizer 2P
8. Study of fire tube and water tube boilers 2P
9. Study of construction of motors 2P
10. Study the construction and working of burden pressure gauge. Test and calibration of pressure gauges using dead weight tester 2P
11. Industrial Visit 3P

Reference Books & Suggested readings:

1. Dairy Technology & Engineering by H.G. Kessler
2. Dairy Plant Engineering & Management by Tufail Ahmed
3. Laboratory manual in Dairy Engineering-I by KhojareA.s.,Wasnik P.G., Kadu A.B. andWaseem M

B. Voc. Second Year **Paper No. BDT-3.2** **Semester III**

Fermented Milk Products (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 Practical/Semester (4 Period Each)**

Objectives-

- To understand need and importance of fermented products
- To understand technology behind preparation of fermented milk products

1. Preparation of Dahi 1P
2. Preparation of Mishti doi 1P
3. Preparation of Lassi 2P
4. Preparation of Yogurt 2P
5. Preparation of Shrikhand 2P
6. Preparation of Processed Cheese 4P
7. Preparation of Processed Cheese Spread 4P
8. Preparation of cheddar cheese 4P
9. Preparation of mozzarella cheese 2P
10. Visit to cheese factory 2P

B. Voc. Second Year **Paper No. BDT-3.3** **Semester III**

Nutrition Science (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 Practical/Semester (4 Period Each)**

Objectives-

- **To prepare different nutrient rich products**

1) Identification of food sources for various nutrients
2) Introduction to diet planning using food exchange list
3) Diet Planning of adult male / female
4) Assessment of weight and height of self and calculation of BMI
5) Planning of Protein and Energy rich Product.
6) Planning of Vitamin A rich Product.
7) Planning of Vitamin B1 rich Product.
8) Planning of Vitamin B2 rich Product.
9) Planning of Vitamin B3 rich Product.
10) Planning of Vitamin C rich Product.
11) Planning of Calcium rich Product.
12) Planning of Iron rich Product.
13) Record diet of self-using 24 hour dietary recall
14) Evaluation of own diet and weight status

- **B. Voc. Second Year Paper No. BDT-401 Semester IV**

Dairy Engineering (Theory-General Education)

Maximum Marks: 100 **Credits: 4**
Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- To study the different utilities used in dairy plant
- To study refrigeration unit, its working, and principle

Unit-1Refrigeration:Principles of Vapor compression refrigeration cycle, refrigeration components, common refrigerants, properties of good refrigerants, Ice bank Tank (IBT), Bulk milk cooler **12 Periods**

Unit-2Basic electrical engineering: Alternating current fundamentals, Polyphase alternating current circuits, star & delta connections. AC Motors, starters & DG set, Fundamentals of Transformer **12 Periods**

Unit-3Water Supply and Dairy Effluent System: Tube well, water storage and supply, Water quality water treatments and purification, Waste water treatment, reuse and disposal, Water conservation and rain water harvesting **12 Periods**

Unit-4Heat and heat transfer: Heat transfer Principle and Laws, Types of heat exchangers, their installation & working, Microwave heating of milk and milk products. Evaporators and dryers, Humidifiers **12 Periods**

Unit-5Equipments and Milk storage: Butter churners – Types, Installation, working & Maintenance, Ice-Cream freezers-Types & working,Ghee Vat, Cheese Vat, Paneer Equipments, Milk storage tanks and milk silos, Packaging equipments of milk/ dairy products and processing units of UHT plant **12 Periods**

References:

1. Refrigeration and Air conditioning(1993) Arrora S.C. Domkundwar S.
2. Engineering Thermodynamics (1977) Gupta C.P. , Prakash Rajendra

3. Food Engineering systems (1979) Farrall Arthur W.

B. Voc. Second Year **Paper No. BDT-402** **Semester IV**

Traditional Indian Dairy Products (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period**

Objectives-

- **To know importance of indigenous milk product and its market demand**
- **To learn the making process of different indigenous milk products**
- **To study the defects to the products and prevention**

Unit 1- Heat desiccated products **12 Periods**

- Definition, Composition, And standards of Khoa and Basundi
- Methods of manufacture and factors affecting quality of products
- Khoa based sweets

Unit 2- Paneer and Chhana **12 Periods**

Definition, Composition, Standards and Factors affecting quality of Paneer and Chhana, Methods of manufacturing Paneer and Chhana, Chhana based sweets

Unit 3- Concentrated Milks **12 Periods**

Definition, standards and nutritive value and principle of evaporation, methods of manufacture and use of sweetened condensed and evaporated milks

Unit 4 Fat Rich Products

Ghee, Butter Definition, Composition and standards, Methods of manufacturing

Unit 5 Judging and Grading of indigenous milk products **12 Period**

Procedure for examination, Requirements for high grade products, any indigenous products, defects and their causes and prevention

References:

1. Milk Products of India – ICAR Anantkrishanan C.P. and Srinivasan M.R.
2. Technology of Indian Milk Products- Aneja R.P., Mathur B.N.
3. Indian Dairy Products (1974) Rangappa K.S., Acharya K.T.

B. Voc. First Year **Paper No. BDT-403** **Semester IV**

Food Safety, Hygiene and Sanitation (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives: To understand the following:

- Food safety, hygiene and sanitation
- Industrial waste utilization
- Design and implementation of food safety management systems such as ISO series, HACCP and its prerequisites such as GMP, GHP etc.

Unit-1: Introduction to Food Safety: Definition, Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Foods **12 Periods**

Unit-2: Food Safety Management Tools: Basic concept, Prerequisites- GHPs ,GMPs, SOPs etc, HACCP, ISO series, TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis, Accreditation and Auditing **12 Periods**

Unit-3: Industrial byproducts and waste utilization: Potential & prospects of byproduct & waste utilization from the food Industries in India Byproduct & waste with special reference to milk & milk products **12 Periods**

Unit-4:Hygiene and Sanitation in Food Service Establishments: Introduction, Sources of contamination, Control methods using physical and chemical agents, Waste Disposal, Pest and Rodent Control, Personnel Hygiene, Food Safety Measures **12 Periods**

Unit-5: Recent concerns: New and Emerging Pathogens, Packaging, Product labelling and Nutritional labeling, genetically modified foods\Transgenics, Organic foods, Newer approaches to food safety, Recent Outbreaks. **12 Periods**

References:

1. Lawley, R., Curtis L. and Davis, J. The Food Safety Hazard Guidebook , RSC publishing, 2004
2. De Vries. Food Safety and Toxicity, CRC, New York, 1997
3. Marriott, Norman G. Principles of Food Sanitation, AVI, New York, 1985
4. Forsythe, S J. Microbiology of Safe Food, Blackwell Science, Oxford, 2000 &Sons; USA, 1987
5. Quality Control for Food Industry – Krammer& Twig

B. Voc. Second Year **Paper No. BDT-4.1** **Semester IV**

Dairy Engineering (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 practical/Semester (4 Period Each)**

Objectives-

- To study the different utilities used in dairy industry

1. Study of home refrigerator 3P
2. Study and identification of milk storage units 3P
3. Study of Parts and operations of a cold storage plant and ice bank unit 3P
4. Study the different parts and learn the operations of the plate chillers and bulk milk coolers 3P
5. Study of water supply system and water softening plant 3P
6. Study of different safety measures to be adopted in a dairy plant 3P
7. Study of various workshop tools 3P
8. To learn elementary layout, drawings of utilities 3P

B. Voc. Second Year **Paper No. BDT-4.2** **Semester IV**

Traditional Indian Dairy Products (Practical-Skill Component)

Maximum Marks: 150 **Credits: 4**
Teaching Period: 2/Week **Teaching Load: 24 Practical/Semester (4 Period Each)**

Objectives-

- To learn the making process of different indigenous milk products

1. Preparation of Khoa 1P
2. Preparation of Gulabjamun 2P
3. Preparation of Rassgulla 2P
4. Preparation of Pedha 3P
5. Preparation of Barfi 3P
6. Preparation of Kalakand 2P
7. Preparation of Chhana 3P
8. Preparation of Chakka 2P
9. Preparation of Rasmalai 3P
10. Preparation of Paneer 3P

B. Voc. First Year **Paper No. BDT-4.3** **Semester IV**

Hygiene and Sanitation (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**
Teaching Period: 2/Week **Teaching Load: 24 Practical/Semester (4 Period Each)**

Objectives-

- To study different schedules and charts
- To study the properties and use of different detergents, sanitizers and their required strength.

1. Preparation of inspection schedule and inspection charts. 4P
2. Study of CIP system 4P
3. Preparation of detergent & sanitizer solutions of desired strength. 4P
4. Test for sanitization of dairy equipment (Swab method) 4P
5. Contamination Control methods using physical and chemical agents 4P
6. To study Personnel Hygiene habits 4P

B. Voc. Third Year **Paper No. BDT-501** **Semester V**

Quality Assurance and Waste Management (Theory-General Education)

Maximum Marks: 100 **Credits: 4**
Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- To understand the importance of quality in food production
- To learn various methods of analysis of dairy and food products
- To learn the importance of waste management.

Unit 1- Quality: Definition and Importance, Quality control management system, Good manufacturing practices, good hygienic practice and HACCP **12 Periods**

Unit 2- Chemical and Microbiological analysis of Dairy products: Rule and regulations governing dairy industry, sampling of milk and milk products, chemical analysis of milk and milk products, microbiological analysis of milk and milk products **12 Periods**

Unit 3- Sensory Evaluation: Definition, Application of sensory, Quality Parameter and sensory lab requirements, Selection and training of sensory panelists and method of sensory evaluation, judging of milk and milk products **12 Periods**

Unit 4- Packaging Materials and Other Food Ingredients-Definition, types of packaging material, Properties and basic requirement, General packaging materials – Paper, Glass, Plastic, Metal, Foil. MAP, CAP, Packaging materials and specifications, testing of packaging materials, Standards for food ingredients. **12 Periods**

Unit 5- Waste Management: Properties and requirements of processing water, water hardness, other impurities, chlorination, Properties of waste water Physical, Chemical, Biological nature of impurities, BOD, Water waste treatments, Primary and Secondary treatments. **12 Periods**

References-

1. Quality Control for Food and Agriculture Products
2. Food safety and standards act- 2006 Ministry of food processing industries.
3. Sensory Evaluation Practices- Stone H, and Sidel J. (1993)
4. Modern Food packaging (1998)- Indian institute of packaging

B. Voc. Third Year **Paper No. BDT-502** **Semester V**

Fat Rich Milk Products (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- To understand the range of products made from milk fat
- To learn the making procedure and principle.

Unit-1 Cream: Definition, Composition, Standards and Processing of Cream**,** Preparation of Different Types of Cream**,** Packaging, Storage and Common Defects in Cream **12 Periods**

Unit-2 Butter: Definition, Standards and Principles of Butter Making, Methods of Manufacture of Butter, Packaging, Storage and Common Defects in Butter**12 Periods**

Unit-3 Ghee, Butter-oil and Fat-rich Products: Definition, Composition and Standards of Ghee and Butter Oil**,** Principles and Methods of Manufacture of Ghee and Butter Oil **12 Periods**

Unit-4 Packaging, Storage, Keeping Quality Extension and Adulteration of Ghee **12 Periods**

Unit-5 Fat-rich Products in Dairy and Food Industries **12 Periods**

References-

- Dairy Plant Engineering and Management (1990) Tufail Ahmad
- Outlines of Dairy Technology, (1980) Sukumar De
- Milk Products of India – ICAR Anantkrishanan C.P. and Srinivasan M.R.
- Technology of Indian Milk Products- Aneja R.P., Mathur B.N.
- Indian Dairy Products (1974) Rangappa K.S., Acharya K.T.

B. Voc. Third Year Paper No. BDT-503 Semester V

Dairy Technology (Theory-General Education)

Maximum Marks: 100 Credits: 4

Teaching Period: 4/Week Teaching Load: 60 Theory Period/Semester

Objectives-

- To understand the different types of milk and their making procedures, compositions and use.
- To learn about frozen dairy products, their making procedure and technology used in making.

Unit 1- Condensed Milks-Definition, concept, manufacturing process, judging, grading and defects of condensed milk, **12 Periods**

Unit 2 Dried Milk Products-Definition, Composition, Classification, Standards and principles of drying, changes during drying, advantages and disadvantages of drying, , infant baby food, SMP, WMP, WPC, Ice cream mix powder **12 Periods**

Unit 3 Ice Cream: Definition, Composition, Classification and Standards (Legal and Others)Principle and Method of Manufacture. Technology used in ice cream making **12 Periods**

Unit 4- Frozen Dairy Deserts: Definition, Composition, Classification and Standards (Legal and Others)Principle and Method of Manufacture **12 Periods**

Unit-5By – Products: Skim Milk – Casein and Caseinates, Whey – Whey Beverages, Whey Powder, Lactose, Whey Protein Concentrates, Buttermilk and Ghee Residue, New Technologies in By-product Utilization (Membrane Processing – Reverse Osmosis and Ultra Filtration) **12 Periods**

References-

- Ice Cream 4th Edition – Arbuckle W.S. (1986)
- Ice Cream: Manufacture and Technology- Bhandari Vivek (2001)
- By Products from milks – Webb B.H. (1970)
- Outlines of Dairy Technology, (1980) Sukumar De

B. Voc. Third Year **Paper No. BDT-5.1** **Semester V**

Quality Assurance and Waste Management (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 practical/Semester (4 Period Each)**

Objectives-

- To learn different analysis methods used for analyse of different quality parameters of food

1. Determination of acid value in Ghee
2. Determination of Titrable acidity and pH of milk and milk products
3. Determination of COD
4. Determination of BOD
5. Microbiological Analysis of air and water
6. Test for sanitization of dairy equipment (Swab method)

B. Voc. Third Year **Paper No. BDT-5.2** **Semester V**

Fat Rich Milk Products (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 practical/Semester (4 Period Each)**

OBJECTIVES-

- To learn the making procedure and principle.

1. Preparation and Standardization of Cream
2. Preparation of Sterilized Cream
3. Preparation of Butter Starter
4. Preparation of Cream for Butter Making
5. Preparation of Desi Butter (Makkhan), Table Butter and Cooking Butter
6. Cooking Butter by Hand Operated Churn.
7. Study of Manufacture of Table Butter by Power Churn.
8. Preparation of Ghee

B. Voc. Third Year **Paper No. BDT-5.3** **Semester V**

Project (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 practical/Semester (4 Period Each)**

Group of four students shall undertake project work related to design and development of innovative food product, its quality evaluation, packaging, labeling and shelf life testing under the supervision of a faculty member. In principle, the research /design work has to be carried out by the student himself taking advice from his supervisor when problem arises. The work will be allotted at the beginning of the fifth semester specifying the different aspects to be carried out by the student. At the end of the semester the student will submit an interim report on his/her work in typed form. Evaluation shall include oral presentation.

B. Voc. Third Year **Paper No. BDT-601** **Semester VI**

Entrepreneurship Development (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- To understand the concept of entrepreneurship
- To learn key skills for being a successful entrepreneur

Unit-1: Entrepreneurship: Introduction, Entrepreneurs (Concept), Technical Entrepreneurs, Need of the Entrepreneurship development, Quality of an entrepreneurs, rewards and penalties for an entrepreneur, characteristics and traits of an entrepreneurs. **12 Periods**

Unit-2: Entrepreneurial Support System: Introduction, Sources of Information, Application forms, District Industry Centre (DICs), Role of commercial bank for financial assistant, SISI, NSIC, SIDBI and NABARD. **12 Periods**

Unit-3: Project Report Preparation: Introduction, Preliminary project report, Techno-economic Feasibility Report, Detailed Project Report (DPR), Project Viability and Project Appraisal. **12 Periods**

Unit-4: Market Survey and Opportunity Identification: Business Planning, Personal Quality as an entrepreneurs, Procedure for starting small scale industry, Identification of Business Opportunity, Process of final product selection **12 Periods**

Unit-5 Legal Aspect of small business: Introduction, Principal of Taxation, Factory Act, 1948, **Environmental considerations:** Introduction, concept of Ecology and Environment, Environmental, Water and Air Pollution Factors. Safety at work place and Personal Protection Equipment. **12 Periods**

References:

1) Entrepreneurship development and Management, R.K.Singal, S.K.Kataria and Sons.
2) Developing Entrepreneurship, Pareek& Co. Learning systems,Delhi
3) Entrepreneurship & Venture – Management, Clifford and Bombak, Joseph R. Momanso.
4) Planning an Industrial unit, J. N. Vyas.
5) EDI study material, EDI, BHAT, Ahmedabad, Website : http://www.ediindia.org

B. Voc. Third Year **Paper No. BDT-602** **Semester VI**

Dairy Plant Management (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Objectives-

- To learn basics of management
- To learn key skills in managing the efficiency and man power of the dairy plant.

Unit 1- Production management: Introduction, definition, Function and structure of production management, Production planning and control **12 Periods**

Unit 2- Efficiency of Plant Operation: Introduction, definition, Product accounting, Setting up norms for operational and processing losses for quantity of fat and SNF, Monitoring efficiency **12 Periods**

Unit 3- Plant Operations: Energy conservation and auditing, Product and process control, Control charts, Process Sigma, Efficiency factors losses, financial and managerial efficiency, Provision for industrial legislation in India particularly in dairy industry. **12 Periods**

Unit 4- Human Resource Management: Personnel management, Manpower Planning, Recruitment, training, transfer, promotion policies, job specifications, job evaluation, Job enhancement, Job enrichment, MBO, working conditions **12 Periods**

Unit 5- Dairy Plant Design and Layout: Introduction, Types of dairies, Location of the plant, selection of site, Hygiene design considerations, Space requirement, Single and multilevel design, layout of process section, foundations, walls, windows and doors. **12 Periods**

References-

- Dairy Plant Management- D.B. Puranik
- Management of dairy plants- Martin Mortensen (2012)
- In milk plant layout FAO- H.S. Hall, B. Helge (1963)
- Competitive global management Principles and Strategies , Abbas F, Alkhafaji (1995)

B. Voc. Third Year Paper No. BDT-603 Semester VI

Packaging Technology (Theory-General Education)

Maximum Marks: 100 **Credits: 4**

Teaching Period: 4/Week **Teaching Load: 60 Theory Period/Semester**

Unit-1: Introduction, Protection of Food products - major role of food packaging - Functions of packaging, Need for protective packaging. Packaging requirements and selection of packaging materials; Types of Container, packaging materials and Forms: Paper and Glass

Unit-2: Metals: Tinplate containers, tinning process, components of tinplate, tin free steel (TFS), types of cans, aluminum containers, lacquers; Plastics: types of plastic films, laminated plastic materials, co-extrusion, edible films, biodegradable plastics.

Unit-3: Test for Packaging Materials, their methods of testing and evaluation; Barrier properties of packaging materials: Theory of permeability, factors affecting permeability, permeability coefficient, gas transmission rate (GTR) and water vapor transmission (WVTR) rate and its measurement

Unit-4: Food packaging systems: Different forms of packaging such as rigid, semi rigid, flexible forms and different packaging system for (a) dehydrated foods (b) frozen foods (c) dairy products (d) fresh fruits and vegetables (e) meat, poultry and sea foods.

Unit-5: Vacuum, CA and MA packaging systems, gas packaging machine; seal and shrink packaging machine; form and fill sealing machine; aseptic packaging systems; bottling machines; carton making machines.

B. Voc. First Year **Paper No. BDT-6.1** **Semester VI**

In-Plant Training/Project (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Objective-

Students should undergo a project work for a period of 90 days, during the Six Semester. The programme is arranged by the Department of Food Technology and Research in consultation with the Dairy/Food industries. The purpose of the programme is to get hands-on experience on various aspects of Dairy/Food industries that form the strong foundation for the young Dairy/Food technologists. The department will allot students to the industry, in consultation with the industry concerned. Student should report for the programme on the stipulated date. On completion, each student should prepare a project report duly certified by the supervisor in the industry. Consequently, a seminar should be conducted in the department to present the finding of the project work. The bonafide project report attested by the head of the department will be evaluated by the external and internal examiner and a viva voce will be conducted.

B. Voc. First Year **Paper No. BDT-6.2** **Semester VI**

Dairy Product Development (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 practical/Semester (4 Period Each)**

Objectives-

- **To prepare and study different types of milks and it's processing.**

1. Preparation of flavoured milk
2. Preparation of condensed milk
3. Preparation of Ice cream
4. Preparation of SMP/WMP by spray drying
5. Preparation of rehydrated milk
6. Preparation of recombinant Milk
7. Preparation of whey powder
8. Preparation of whey beverages

B. Voc. Third Year **Paper No. BDT-6.3** **Semester VI**

Packaging Technology (Practical-Skill Component)

Maximum Marks: 150 **Credits: 6**

Teaching Period: 2/Week **Teaching Load: 24 practical/Semester (4 Period Each)**

1) Identification and testing of packaging materials

2) Determination of wax from wax paper;
3) Testing of lacquered tin plate sheets;
4) Measurement of tin
5) Determination of equilibrium moisture content;
6) Grading of glass bottles for alkalinity;
7) Determination of water vapour transmission rate of packaging material;
8) To perform vacuum packaging of food sample and carry out its storage study;
9) Testing the compression strength of the boxes;
10) Packaging the food material in seal and shrink packaging machine and study its shelf life;
11) Testing the strength of glass containers by thermal shock test; Testing the strength of filled pouches by drop tester.
12) Preparation of album of different types of packaging.
13) Visit to industry
14) Preparation of visit report & presentation

References

1. Crosby NT.1981. *Food Packaging: Aspects of Analysis and Migration Contaminants*. App. Sci. Publ.
2. Kadoya T. (Ed). 1990. Food Packaging. Academic Press.
3. Mahadeviah M & Gowramma RV. 1996. *Food Packaging Materials*. Tata McGraw Hill.
4. Palling SJ. (Ed). 1980. *Developments in Food Packaging*. App. Sci. Publ.
5. Painy FA. 1992. *A Handbook of Food Packaging*. Blackie Academic.
6. Sacharow S & Griffin RC. 1980. *Principles of Food Packaging*. AVI Publ.
7. Stanley S & Roger CG.1970. *Food Packaging*. AVI Publ.
8. Gordon L. Robertson: Food Packaging- Principles and Practice Marcel Dekker Inc,USA (1993)
9. Donald Downing: Complete Course in Canning (3 Volumes) CTI Publications inc, USA (1996)
10. Mathlouthi M. (Editor): Food Packaging and Preservation Elsevier Applied Science Publications Essex, UK (1986)
11. J. R.D.David, R. H Graves and V.R. Carlson: Aseptic Processing and Packaging of Foods: CRC Press, New York