Bachelor of Vocational Programme

in

Dairy Production and Technology

SYLLABUS

(with effect from July 2018)

The Gandhigram Rural Institute

(Deemed to be University)

Gandhigram, Dindigul Dist – 624 302.

Tamil Nadu.

B.Voc. Dairy Production and Technology

Syllabus Outline - I Year

Course code	Category	Title of Course	Credits	NSQF	Job role
I Semester					
18ENGV0101	GEC	Technical Writing & Communication Skills	4	**4**	**Dairy Farm Assistant**
18DPTV0101	GEC	Dairy Development Plans	2		
18DPTV0102	GEC	Dairy Hygiene	3		
18YOGV0001	GEC	Yoga Education	1		
		Total	**10**		
18DPTV0103	SDC	Dairy Husbandry	2		
18DPTV0104	SDC	Fodder Production and Dairy Cattle Nutrition	3		
18DPTV0105	SDC	Dairy Cattle Management	2		
18DPTV0106	SDC	Practical I – Dairy Husbandry Practices	3		
18DPTV0107	SDC	Practical II - Zootechny	3		
18DPTV0108	SDC	Practical III – Dairy Cattle Management	3		
18DPTV0109	SDC	Experiential Learning I – Dairy Farm Training	4		
		Total	**20**		
		Grand total	**30**		
II Semester				**NSQF**	**Job role**
18DPTV0210	GEC	Rural Resource Appraisal	5	**5**	**Chilling Plant Technician**
18DPTV0211	GEC	Milk Hygiene and Public Health	4		
18DPTV0212	GEC	Milk Procurement	3		
		Total	**12**		
18DPTV0213	SDC	Dairy Engineering I (Refrigeration and Chilling Equipment)	2		
18DPTV0214	SDC	Dairy Chemistry	2		
18DPTV0215	SDC	Dairy Microbiology	2		
18DPTV0216	SDC	Practical IV (Dairy Chemistry)	3		
18DPTV0217	SDC	Practical V (Dairy Microbiology)	3		
18DPTV0218	SDC	Inplant training – Chilling centre	6		
		Total	**18**		
		Grand total	**30**		

B.Voc. Dairy Production and Technology

Syllabus Outline - II Year

Course code	Category	Title of Course	Credits	NSQF	Job role
		III Semester			
18DPTV0319	GEC	Environmental Studies and Disaster Management	4	**6**	**Milk Processing Plant Supervisor and Quality Controller**
	GEC	NSS / Santhi Sena	1		
	GEC	Sports and Games/ Fine arts	1		
	GEC	Computer fundamentals and Office Automation	4		
18DPTV0320	GEC	General Laboratory Practices	2		
			12		
18DPTV0321	SDC	Dairy Engineering -II (Steam & Steam Boiler)	3		
18DPTV0322	SDC	Dairy Technology - I (Market milk)	3		
18DPTV0323	SDC	Milk Processing and Preservation	3		
18DPTV0324	SDC	Practical VI (Market milk)	3		
18DPTV0325	SDC	Inplant Training (Milk processing)	6		
		Total	**18**		
		Grant Total	**30**		
		IV Semester			
18DPTV0426	GEC	IT Application in Dairy industry	4		
18DPTV0427	GEC	Occupational Health and Safety in Dairy Industry	2		
18ENAV0001	GEC	Energy Auditing	1		
18DPTV0428	GEC	Introduction to Statistics	2		
18DPTV0429	GEC	Dairy Plant Design and Layout	3		
			12		
18DPTV0430	SDC	Dairy Plant Management	3		
18DPTV0431	SDC	Dairy Engineering – III (Operation and Maintenance of Dairy Machineries)	3		
18DPTV0432	SDC	Food Safety and Quality Standards	3		
18DPTV0433	SDC	Practical VII (Plant Management)	3		
18DPTV0434	SDC	In plant training (Quality Control)	6		
		Total	**18**		
		Grant total	**30**		

B.Voc. Dairy Production and Technology
Syllabus Outline - III Year

Course code	Category	Title of Course	Credits	NSQF	Job Role
V Semester				**7**	**Dairy Production Manager and Entrepreneur**
18DPTV0535	GEC	Dairy Economics and Marketing	3		
18DPTV0536	GEC	Adulterants and Contaminants in Milk and Milk Products	4		
18DPTV0537	GEC	Dairy Food Ingredients and Additives	3		
18DPTV0538	GEC	Dairy plant – Case study	2		
		Total	**12**		
18DPTV0539	SDC	Dairy Technology – II (Fat and Protein Rich Milk Products)	3		
18DPTV0540	SDC	Dairy Technology - III (Traditional and Value Added Dairy Products)	3		
18DPTV0541	SDC	Packaging and Judging of Milk Products	3		
18DPTV0542	SDC	Practical VIII (Product Development I)	3		
18DPTV0543	SDC	Experiential Learning II – Product Manufacturing	6		
		Total	**18**		
		Grant total	**30**		
VI Semester					
18DPTV0644	GEC	Entrepreneurial Skills and Business Trade	3		
18DPTV0645	GEC	Dairy Extension Education	3		
18DPTV0646	GEC	By Products Utilization	3		
18DPTV0647	GEC	Waste Disposal and Effluent Treatment	3		
		Total	**12**		
18DPTV0648	SDC	Dairy Technology - IV (Cultured, Frozen and Dried Milk Products)	3		
18DPTV0649	SDC	Dairy Novelties and Modeling	2		
18DPTV0650	SDC	Practical- IX (Product development II)	3		
18DPTV0651	SDC	Inplant training (Overall Dairy Industry)	10		
		Total	**18**		
		Grant total	**30**		

Distribution of Contact hours in a Semester

Semester	General Education Component (GEC) (Hours/ Week)	Skill Development Component (SDC) (Hours/ Week)	TOTAL Hours/ Week
I	10	20	30
II	12	18	30
III	12	18	30
IV	12	18	30
V	12	18	30
VI	12	18	30
TOTAL	70	110	180

SCHEME OF EVALUATION

Scheme of Evaluation for Ist Semester

	Course code	Category	Title of Course	Credits	Marks		
					Mid Sem	End Sem	Total
I Semester	18ENGV0101	GEC	Technical Writing & Communication Skills	4	40	60	100
	18DPTV0101	GEC	Dairy Development Plans	2	20	30	50
	18DPT V0102	GEC	Dairy hygiene	3	40	60	100
	18YOGV0001	GEC	Yoga Education	1	50	-	50
				10	**150**	**150**	**300**
	18DPTV0103	SDC	Dairy Husbandry	2	20	30	50
	18DPTV0104	SDC	Fodder Production and Dairy Cattle Nutrition	3	40	60	100
	18DPTV0105	SDC	Dairy Cattle Management	2	20	30	50
	18DPTV0106	SDC	Practices I –Dairy Husbandry Practices	3	60	40	100
	18DPTV0107	SDC	Practical -Zootechny	3	60	40	100
	18DPTV0108	SDC	Practical III – Dairy Cattle Management	3	60	40	100
	18DPTV0109	SDC	Experiential Learning I - Dairy Farm Training	4	100	-	100
			Total	**20**	**360**	**240**	**600**
			Grant total	**30**	**510**	**390**	**900**

Scheme of Evaluation for IInd Semester

	Course code	Category	Title of Course	Credits	Marks		
					Mid Sem	End Sem	Total
II Semester	18DPTV0210	GEC	Rural Resource Appraisal	5	100	-	100
	18DPTV0211	GEC	Milk Hygiene and public Health	4	40	60	100
	18DPTV0212	GEC	Milk Procurement	3	40	60	100
				12	**180**	**120**	**300**
	18DPTV0213	SDC	Dairy Engineering-II (Refrigeration and Chilling Equipment)	2	20	30	50
	18DPTV0214	SDC	Dairy Chemistry	2	20	30	50
	18DPTV0215	SDC	Dairy Microbiology	2	20	30	50
	18DPTV0216	SDC	Practical IV (Dairy Chemistry)	3	60	40	100
	18DPTV0217	SDC	Practical V (Dairy Microbiology)	3	60	40	100
	18DPTV0218	SDC	Inplant training	6	100	-	100
			Total	**18**	**280**	**170**	**450**
			Grant total	**30**	**460**	**290**	**750**

Scheme of Evaluation for III[rd] Semester

	Course code	Category	Title of Course	Credits	Marks		
					Mid Sem	End Sem	Total
III Semester	18DPTV0319	GEC	Environmental studies and Disaster Management	4	40	60	100
		GEC	NSS/ Santhi Sena	1	50	-	50
		GEC	Sports/ Games / Fine Arts	1	50	-	50
		GEC	Computer fundamentals and office automation	4	40	60	100
	18DPTV0320	GEC	General Laboratory Practices	2	50	-	50
				12	**200**	**150**	**350**
	18DPTV0321	SDC	Dairy Engineering-III (Steam and Steam Boiler)	3	40	60	100
	18DPTV0322	SDC	Dairy Technology –I (Market Milk)	3	40	60	100
	18DPTV0323	SDC	Milk Processing and Preservation	3	40	60	100
	18DPTV0324	SDC	Practical VI (Market Milk)	3	60	40	100
	18DPTV0325	SDC	Inplant training (Milk Processing)	6	100	-	100
			Total	**18**	**280**	**220**	**500**
			Grant total	**30**	**480**	**370**	**850**

Scheme of Evaluation for IVth Semester

	Course code	Category	Title of Course	Credits	Marks		
					Mid Sem	End Sem	Total
IV Semester	18DPTV0426	GEC	IT application in Dairy Industry	4	40	60	100
	18DPTV0427	GEC	Occupational health and safety in Dairy Industry	2	20	30	50
	18ENAV0001	GEC	Energy Auditing	1	50	-	50
	18DPTV0428	GEC	Introduction in Statistics	2	20	30	50
	18DPTV0429	GEC	Dairy Plant Design and Layout	3	40	60	100
				12	**170**	**180**	**350**
	18DPTV0430	SDC	Dairy Plant Management	3	40	60	100
	18DPTV0431	SDC	Dairy Engineering III (Operation and Maintenance of Dairy Machinery)	3	40	60	100
	18DPTV0432	SDC	Food Safety and Quality Standards	3	40	60	100
	18DPTV0433	SDC	Practical VII (Plant Management)	3	60	40	100
	18DPTV0434	SDC	Inplant Training (Quality Control)	6	100	-	100
			Total	**18**	**280**	**220**	**500**
			Grant total	**30**	**450**	**400**	**850**

Scheme of Evaluation for Vth Semester

	Course code	Category	Title of Course	Credits	Marks		
					Mid Sem	End Sem	Total
V Semester	18DPTV0535	GEC	Dairy Economics and Marketing	3	40	60	100
	18DPTV0536	GEC	Adulterants and Contaminants in Milk and Milk Products	4	40	60	100
	18DPTV0537	GEC	Dairy Food Ingredients and Additives	3	40	60	100
	18DPTV0538	GEC	Dairy plant – Case study	2	50	-	50
				12	**170**	**180**	**350**
	18DPTV0539	SDC	Dairy Technology – II (Fat and Protein Rich Milk Products)	3	40	60	100
	18DPTV0540	SDC	Dairy Technology - III (Traditional and Value Added Dairy Products)	3	40	60	100
	18DPTV0541	SDC	Packaging And Judging of Milk Products	3	40	60	100
	18DPTV0542	SDC	Practical VIII (Product Development I)	3	60	40	100
	18DPTV0543	SDC	Experiential Learning II – Product Manufacturing	6	100	-	100
			Total	**18**	**280**	**220**	**500**
			Grant total	**30**	**450**	**400**	**850**

Scheme of Evaluation for VIth Semester

	Course code	Category	Title of Course	Credits	Marks		
					Mid Sem	End Sem	Total
VI Semester	18DPTV0644	GEC	Entrepreneurial Skills and Business Trade	3	40	60	100
	18DPTV0645	GEC	Dairy Extension Education	3	40	60	100
	18DPTV0646	GEC	By Products Utilization	3	40	60	100
	18DPTV0647	GEC	Waste Disposal and Effluent Treatment	3	40	60	100
				12	**160**	**240**	**400**
	18DPTV0648	SDC	Dairy Technology - IV (Cultured, Frozen and Dried Milk Products)	3	40	60	100
	18DPTV0649	SDC	Dairy Novelties and Modeling	2	50	-	50
	18DPTV0650	SDC	Practical- IX (Product development II)	3	60	40	100
	18DPTV0651	SDC	Inplant training (Overall Dairy Industry)	10	100	-	100
			Total	**18**	**250**	**100**	**350**
			Grant total	**30**	**410**	**340**	**750**

Scheme of Evaluation abstract

Semester	General Education Component (GEC) (Marks)	Skill Development Component (SDC) (Marks)	TOTAL Marks
I	510	390	900
II	460	290	750
III	480	370	850
IV	450	400	850
V	450	400	850
VI	410	340	750
TOTAL Marks	**2760**	**2190**	**4950**

SYLLABUS

SEMESTER - I

Semester I

18ENGV0101-TECHNICAL WRITING AND COMMUNICATION SKILLS

(Credits 4)

Objectives:

- To improve the English language skills of students with very limited abilities to use the language;
- To focus on the language skills of the learners in a graded manner.

Learning Outcome

- Students know improve the English language skills with very limited abilities to use the language;
- Students focus on the language skills of the learners in a graded manner.

Unit I : **Grammar:** What is grammar? - The capital letter - Nouns and pronouns and Tenses.

Unit II : **Listening:** Teacher narrations

Unit III : **Speaking Skills:** Self – introduction - Descriptions of persons, objects, places

Unit IV : **Reading and Vocabulary:** Graded reading comprehension passages

Unit V : **Writing Skills:** Sentence construction - Descriptive Paragraph writing, Précis writing, Essay and letter writing, CV and Resume.

Textbook

1. Course material prepared by the English faculty

References:

1. Seaton, Anne & Y.H. Mew. Basic English Grammar Book 1. Irvine: Saddleback, 2007. Print.

Semester I

18DPTV0101 - DAIRY DEVELOPMENT PLANS (Credits 2)

Objectives

- To enlighten the students about the dairy development.
- To understand the organizational structure of dairy co-operatives at village, district and state levels.

Learning Outcomes

- Students learn about the role of dairying and status of milk production in India
- Students will acquire skill on dairy cooperative functions and management system
- Students will know about the government and institutional activities and schemes related to dairy development.

Unit I : Role of dairying in Indian economy and rural development. Dairying as source of additional income and employment. Advantages in dairying. Principle involved in successful dairying. Total milk production in country and state with reference to Global milk production – Per capita availability of milk – consumption pattern – annual rate of growth of milk production. Role of milk and milk products in human nutrition. ICMR recommendation.

Unit II : Dairy development programme implemented in India. Operation flood programme. Key village scheme - Intensive Cattle Development Programme (ICDP) - Intensive Dairy Development Programme (IDDP). Institution for dairy development: NDRI, NDDB, NDC and TCMPF.

Unit III : Cooperative dairying – structure of dairy cooperatives, OBJECTIVES and functions, primary milk cooperative societies, district milk producer's cooperative union, state level federations. ANAND pattern and perspectives.

Unit IV : National Dairy Plans: NDPI – NPBB and DD – CCDO- Dairy development under various five year plans- Expenditure on Animal husbandry and Dairying during various plans – Important developments in Different five year plans.

Unit V : Dairy problems; Resource inadequacy, Strategies and Policies: SWOT analysis of Indian dairy industry.

References

Textbooks

1. Anantha Krishnan, C.P., (1991), Technology of milk processing, Sri Lakshmi Publications, Chennai -10.
2. Banerjee, G.C. 1998. A Textbook of Animal husbandry. Oxford and IBH Publ. Co. ltd., New Delhi.
3. Dairy India Year Book. 2007 & 2017. P.R. Gupta Publ., New Delhi.
4. Mudgal, V.D., Singhal, K.K. and Sharma, D.D. 1995. Dairy animal production.1st ed. International Book Distributing Co., Lucknow.
5. Nataraj, B.S. 2007. Marketing of milk and milk products: opportunities for entrepreneurship. In: Souvenir, National workshop on Entrepreneurship Development in Dairy and Food Industry, NDRI, Karnal, December 2005.
6. Sastry, N.S.R. and Thomas, C.K. 1996. Livestock Production Management. Kalyani Publ., New Delhi.
7. Verma, D.N. 1999. Livestock Production Management in tropics. Kalyani publ., New Delhi.

Semester I

18DPTV0102 – DAIRY HYGIENE (Credits 3)

Objectives

- To provide knowledge in hygiene practices so as to improve health status of animal and to produce clean milk
- To impart skill in farm management practices to cope with climate change

Learning Outcome

- Students will get to know about the various sources of contamination
- Students will learn how to manage and protect cattle hygienically.
- Students will learn on the process of cleaning and sanitization at farm.

Unit I **Water Hygiene**: Definition: hygiene and animal hygiene. Uses of water in Dairy farm - water requirement- sources of water - factors influencing water supply – impurities and contaminants in water – water quality - water purification methods – ground water. Hardness of water its significance and treatment. Disinfection of water or sterilization of water. Physical method and chemical method

Unit II **Air Hygiene:** Ventilation and principles of ventilation – Natural and mechanical ventilating - Pollution of air with in animal house from outside – noxious gases – Dusts – odour -Microclimatic requirement for livestock - Quality of indoor air. Environmental pollution -causes, and effects.

Unit III **Waste Management**: Definition for sanitation - Waste from livestock production - solid waste and liquid waste - Method of disposal. General principles of drainages system and traps. Construction of manure pit - Composting, vermin-composting, biogas production and value added manure management - Fly control methods

Unit IV **Cleaning and Disinfection**: Physical method and chemical method –different types of disinfectants. Clean milk production. Prevention of infection- isolation and quarantine – disposal of carcass of dead animal – commonly used disinfectants.

Unit V **Climate change and coping strategies**: Climate change and coping mechanism – Temperature humidity index – impacts of climate change in livestock – adaptation and mitigation options

Practical:

1. Collection and labeling of water samples
2. Physical quality of water
3. Estimation of total solids in water
4. Qualitative analysis of water – non-metallic impurities
5. Qualitative analysis of water – metallic impurities
6. Estimation of chlorides in water
7. Test of chlorination
8. Recording of air temperature and relative humidity in animal house
9. Microbial quality of water (Coliform count)
10. Waste management – calculation of manure storage requirements
11. Composting of animal manure
12. Composting of dairy farm waste
13. Vermi composting
14. Disposal of carcass of dead animls

References

Textbooks

1. Banerjee, G.C., 2006. Text book of Animal Husbandry 8thEd.Oxford and IBH Publishing Company Ltd., New Delhi.
2. ICAR, 2013. Hand book of Animal Husbandry, 4thEd.ICAR Publication, Pusa, New Delhi.
3. Jagadish Prasad, 2002. Principles and practices of Dairy Farm Management, 3rd Ed. Kalyani Publishers, Ludhiana.
4. Sastry, N.S.R., C.K.Thomas and R.A.Singh, 2015. Livestock Production Management, 4thEd.Kalyani Publishers, New Delhi.

E-Resources

5. http://www.thedairysite.com/articles/881/livestock-housing-ventilation-natural-ventilation-design-and-management-for-dairy-housing/
6. http://www.who.int/water_sanitation_health/water-quality/en/
7. https://dairy.ahdb.org.uk/technical-information/animal-health-welfare/mastitis/working-arena-prevention-of-infection/housing/ventilation-in-livestock-buildings/#.WT9ZwFWGOM8
8. https://data.unicef.org/topic/water-and-sanitation/overview-2

Semester I

18YOGV0001 - YOGA EDUCATION (Credit 1)

Objective:

- To learn Yoga for keeping body and mind in good condition

Learning Outcomes

- Recognize the importance of preparatory exercise
- To demonstrate the suryanamaskar and various asanas
- To practice meditation
- Able to teach mudras
- Explain about the bandhas
- To know about the Gandhian way of meditation
- Realize the difference between the asanas and physical exercises

Unit I : History of Yoga – Definition of them Yoga – Comprehensive Nature and Scope Yoga – Aims and Objectives of Yoga – Various School of Yoga.

Unit II : Pantanjali yoga – Astangayoga – Tantrayoga – Mantrayoga – Hathayoga – Layayoga –RajayogaGanayoga – Bhaktiyoga – Karmayoga.

Unit III : Yoga as an ideal system of physical culture – Do's and Don'ts of specific yogic Techniques Differences between practice of Asanas and Physical Exercise – Modern vs. Yogic concept on diet.

Unit IV : Preparing Oneself for Yogic practices – Different kinds of Yogic practices – SuryanamaskarAsanas (Padmasana – Vajrasana – Gomukhasana – Ustrasana - Varkrasana –Shalabhasana – Dhanurasana – Paschimottanasana – Yogamudra – Utkatasana – Savasana – Makarasana).

Unit V : Padmayamas (Anuloma – Viloma Pranayama, Nadisuddi) – Bandhas – Mudras –Dhyana – Meditation – Gandhiyan way of Meditation.

References

Textbooks

1. Asanas, Swami Kuvalayananda, Kaivalaydhama, Lonavla, 1993.
2. Light on Yoga, B.K.S IyengarHarpine Collins Publication, New Delhi, 2000.
3. Sound Health Through Yoga, K.Chandrasekaran, PremKalyan Publications, Sedapatti,1999

4. Yoga for all, Maharishi Patanjali, Sahni Publications,2003
5. Yoga for Health, Institute of Naturopathy and Yogic Sciences, Bangalore, 2003.
6. Yoga for Health, K. Chandra Shekar, KhelSahitya Kendra, Theni, 2003.
7. Yoga for the Modern Man, M.P. Pandit, Sterling Publishers Private Limited, New Delhi, 1987.
8. Yoga for You, Indira Devi, Jaico Publishing house, Chennai, 2002.

Semester I

18DPTV0103 - DAIRY HUSBANDRY (Credits 2)

Objectives

The General objective of this course is to establish basic knowledge of how to manage and operate dairy farm.

- This course is designed to impart basic technical knowledge and skills required for entry level positions or to successfully run a dairy farm enterprise by developing competencies concerning the breeding of dairy cattle, housing and health care.
- To provide hands-on experiences with Artificial insemination and other dairy husbandry practices.

Learning Outcome

Unit I: Instruction in lessons in Unit I should result in students achieving the following objectives

1. Describe the size and contribution of dairying to Indian economy and rural livelihood
2. Describe the various breeds of dairy cattle, giving their origin and breed characteristics and milk production capacity.
3. Identify the anatomical parts of the dairy animal
4. Identify various breeds of cattle and buffalo by viewing photographs or live animals.
5. Name the parts of dairy cattle and describe economically important traits.
6. Describe the characteristics of a good dairy cow
7. Select desirable breeding and production animals.
8. Differentiate desirable from undesirable traits

Unit II: Instruction in lessons in Unit II should result in students achieving the following objectives

1. Describe the female reproductive organs.
2. Identify the signs of heat and right time for insemination.
3. Able to identify signs of impending parturition
4. Acquire knowledge in factors affecting age at puberty of heifers
5. Able to identify suitable method of breeding for improving the productivity of herd

6. Able to determine the breeding efficiency of cows and bulls

Unit III: Instruction in lessons in Unit III should result in students achieving the following objectives

1. Describe the male reproductive organs
2. Acquire knowledge in structure of testis and mechanism of sperm production
3. Able to take care of breeding bulls in accordance with good farm practice.
4. Acquire knowledge on basic principles of semen collection and evaluation.
5. Acquire knowledge in freezing of bull semen.
6. Able to handle liquid nitrogen containers
7. Well versed with thawing of frozen semen straws and loading of AI guns.

Unit IV: Instruction in lessons in Unit IV should result in students achieving the following objectives

1. Able to describe the advantages and disadvantages of different types of animal housing
2. Acquire knowledge in planning and designing of animal housing
3. Acquire knowledge in floor space requirement for different class of animal and importance of ventilation in cow shed.
4. Ability to prepare plans for housing of dairy cows.
5. Acquire knowledge in construction details of cow shed.

Unit V: Instruction in lessons in Unit V should result in students achieving the following objectives

1. Able to understand about clean milk production.
2. Able to understand about organic milk production.
3. Acquire knowledge on various methods of milking and sanitation.

Unit I : **Breeds**: Introduction – advantages of dairying – role of dairying in Indian Economy. Livestock census – milk production and availability. Meaning of commonly used terms - Zoological classification of bovine - classification of breeds of cattle - Indigenous and exotic breeds - Red Sindhi – Sahiwal - Gir – Kangayam – Jersey - Holstein Friesian - Brown Swiss. Breeds of buffalo – Murrah – Surti - Nili-Ravi. Selection of dairy cattle – choice of breed.

Unit II : **Cattle Breeding:** Female reproductive system – estrous cycle – signs of heat

– ovulation – fertilization – gestation – parturition – puberty – factors influencing onset of puberty – concept of breeding – inbreeding - out breeding – breeding efficiency.

Unit III : **Artificial insemination** - Male reproductive system - Puberty in male animals – Spermatogenesis - Management of breeding bulls – Semen collection – Semen and its components - Evaluation – Freezing technique – Insemination – Advantage and disadvantages of frozen semen

Unit IV : **Housing**: Types of animal housing – Conventional barn – Loose housing. Selection of site for the farm buildings — Planning and designing – Floor space requirements - Air and ventilation – lighting – Arrangement of farm building - construction details – Foundation – Wall, floor, roof, manager, drain etc.. Building, flooring and roofing materials – roofing pattern – Flooring pattern - Different units of Organised Dairy Farm - Footbath – Farm fence

Unit V : **Clean milk production:** Production of clean milk and organic milk – Animal Hygiene – Milker's hygiene - milking environment – utensils - preparation for milking – methods of milking. – milk handling - Cleaning and disinfection of dairy farm and milk room

References

Textbooks

1. Banerjee, G.C., 2006. Text book of Animal Husbandry 8thEd.Oxford and IBH Publishing Company Ltd., New Delhi.
2. ICAR, 2013. Hand book of Animal Husbandry, 4th Ed., ICAR Publication, Pusa, New Delhi.
3. Jagadish Prasad, 2002. Principles and practices of Dairy Farm Management, 3rd Ed. Kalyani Publishers, Ludhiana.
4. Ranjhan, S.K., and N.N.Pathak, 2003. Text book on buffalo production, 4 Ed. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Sastry, N.S.R., C.K.Thomas and R.A.Singh, 2015. Livestock Production Management, 4thEd.Kalyani Publishers, New Delhi.

Semester I

18DPTV0104 - FODDER PRODUCTION AND DAIRY CATTLE NUTRITION (Credits 3)

Objective

- The course is designed to provide a foundation in the principles of Agricultural operations and Forage Crop Production technologies with emphasis on cultivation of various fodder crops and its utilization in dairy farms.
- To impart the skills and knowledge in cultivation of fodder crops from sowing up to harvest including preservation of fodder that can be applied at farm level.

Learning Outcome

- Students will be able to understand the principles of agricultural operations
- Students will acquire skills on the forage crop production technologies
- Students will learn the method of cultivation of fodder crops and its utilization in dairy farms.

Unit IV: Instruction in lessons in Unit IV should result in students achieving the following objectives

1. Able to list key nutrients for animals
2. Be able to describe the functions of various nutrients in animals and list the sources
3. Able to classify feeds according to their nutritive values
4. Acquire knowledge in feeding value of locally available feed
5. Able to list key nutrients for animals
6. Able to outline how carbohydrates, lipids and proteins can be classified
7. Able to describe the functions of minerals and vitamins in the nutrition of animals, and list the sources as well as the clinical signs associated with deficiency symptoms of these nutrients.
8. Acquire knowledge in the use of urea as protein supplement
9. Able to prepare good quality hay and silage
10. Acquire knowledge to improve the digestibility of poor quality roughage.

Unit V: Instruction in lessons in Unit V should result in students achieving the following objectives

1. Describe the functions of the parts of the digestive systems of cow
2. Able to describe the process of digestion in ruminants
3. Able to calculate the nutrient requirements for dairy cow
4. Able to formulate low cost dairy cattle ration using locally available feedstuffs
5. Able to feed economically according requirement and milk production
6. Design feeding strategies and systems for cattle of different physiological status using feed additives

Unit I : **Introduction to forage crop production:** Importance of fodder crop production-Definition of fodder and forage- Classification of fodder crops-Characteristics of an ideal fodder crop- Harvesting techniques- Agro-forestry-Definition and benefits- Agro forestry systems-Silviculture, silvi pasture, Hortipasture, Agri-silvi-pasture. Hydrophonic fodder.

Unit II : P**roduction technologies for fodder cereals and fodder grassess:** Agronomic packages of practices for Fodder sorghum, Fodder cumbu, Fodder maize, Cumbu-Napier hybrid grass, Guinea grass, Buffel grass(Kolukattai grass), Deenanath grass.

Unit III : **Production Technologies for fodder legumes and fodder tree crops**: Agronomic packages for following crops: - Lucerne –Fodder Cowpea – Desmanthus – Stylo – Subabul - Sesbania and Glyricidia.

Unit IV : **Common feedstuffs:** Nutrients of the feeding stuff – Classification of feed – Roughages – concentrates – root crops and tubers – pasture – Energy feeds – mill by products – oil cakes – urea feeding – silage making – hay making - improving the digestibility of roughage – chaffing - urea treatment –molasses spray.

Unit V : **Digestion and Feeding:** Digestion in ruminants. Nutrient requirements of dairy cattle – DM, TDN and DCP requirements - Thumb rule method of feeding - Desirable characteristics of a ration - feed additives -probiotics – yeast culture - feeding of bypass proteins. Unconventional feeds.

References

Textbooks

1. Balasubramanian, P and S.P.Palaniappan, 2002. Principles and Practices of Agronomy. Agro bios(India), Jodhpur
2. Chatterjee, B.N and P.K.Das, 1989. Forage crop production – Principles and practices, Oxford and IBH, Publishing Co. Pvt.Ltd., New Delhi.
3. ICAR, 1996. Hand book of Agriculture. Indian Council of Agricultural Research, New Delhi
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5. Singh, R.V., 1982. Fodder trees of India, Oxford and IBH publishing Co. Pvt.Ltd., New Delhi.
6. Thakur, C.1980. Scientific crop production. Vol.I and II. Metropolitan Book Co.Pvt.Ltd. New Delhi

Semester I

18DPTV0105 - DAIRY CATTLE MANAGEMENT (Credits 2)

Objectives

The General objective of this course is to establish basic knowledge of how to manage and operate dairy farm.

- This course is designed to impart basic technical knowledge and skills required manage calves, heifers, lactating animals and pregnant animals.
- To provide skill for managing the health of animals and to understand on various diseases that infects animals.

Learning Outcomes

Unit I: Instruction in lessons in Unit I should result in students achieving the following objectives

1. Able to take care of calves immediately after birth in accordance with good farm practice.
2. List the major roles of colostrum: energy, warmth, laxative, passive transfer
3. Know the correct amount and time frame for colostrum intake
4. Describe the feeding requirements of calves from birth to weaning.
5. Select suitable calf rearing systems for given requirements.
6. Prepare milk replacer in accordance with good farm practice.
7. Feed calves with liquid and solid feed in accordance with good farm practice.
8. Clean feeding equipment in accordance with good farm practice.
9. Maintain healthy and productive calves.
10. Identify good and ill health in calves.
11. Give first aid to common ailments of calves

Unit II: Instruction in lessons in Unit II should result in students achieving the following objectives

1. Develop a better understanding of basic dairy heifer nutrition, management and healthcare.
2. Identify the external signs of pregnancy
3. Identify the external signs of parturition
4. Able to take care of dry cows immediately in accordance with good farm practice

5. Able to take care of cows immediately after calving in accordance with good farm practice
6. Able to dispose placenta in accordance with good farm practice.
7. Able to take care of aborted cows
8. Able to take care of cows with retained placenta

Unit III: Instruction in lessons in Unit III should result in students achieving the following objectives

1. Demonstrate knowledge of cow udder and mammary glands
2. Able to describe the process of milk synthesis in mammary gland.
3. Able to take care of lactating cows in accordance with good farm practice.
4. Able to maintain fat and SNF content of milk through feeding at genetically determined level.

Unit IV: Instruction in lessons in Unit IV should result in students achieving the following objectives

1. Able to take care of sick animals
2. Able to identify healthy and sick animals
3. Able describe the basic physical examination of animals for health assessment
4. Able to control common Endoparasites and Ectoparasites
5. Acquire skill in vaccination
6. Able to give first aid to common ailments like Bloat, Carbohydrate engorgement, Diarrhea – Indigestion and Wounds

Unit V: Instruction in lessons in Unit V should result in students achieving the following objectives

1. Able to list and describe the common diseases of cattle
2. Able to diagnose and treat mastitis
3. Able to identify the symptoms and take control measures for common viral diseases like FMD and Rinderpest
4. Able to identify the symptoms and take control measures for common bacterial diseases like, anthrax, black quarters and Hemorrhagic Septicemia
5. Able to identify the symptoms and take control measures for Zoonotic diseases Tuberculosis, Brucellosis and Rabies

Unit I : **Management of calves**: Care of calf at birth – Muconium - Colostrum feeding - System of raising calves – weaning - Milk replacer - Calf starter - Common ailments and their control.

Unit II : **Management of heifers and pregnant animals**: Heifer management - Management of pregnant animals – signs pregnancy and diagnosis of pregnancy – feeding of pregnant cows – care of expectant cows - care at and after calving – Management of dry cows - abortion – retention of placenta.

Unit III : **Management of Lactating Animals:** Milk secretion - Factors affecting milk yield and quality – General care of lactating animals - Strategies to improve fat and SNF content of milk - milking methods – hand and machine milking

Unit IV : **Health care management**: Care of sick animals – Signs of health and ill health – Temperature – Respiration – Pulse. Endoparasitesand deworming – Ectoparasites – Vaccination procedures - Storage and preservation of vaccines – Needles and instrument sterilization – treatment of wounds Common ailments – Bloat – Carbohydrate engorgement(Acidosis) – Diarrhoea – Indigestion..

Unit V : **Common diseases**: Mastitis - Common contagious diseases – Foot and Mouth disease – Rinderpest – Anthrax – Black quarter – Tuberculosis – Johne's disease – Brucellosis – Rabies, Hemorrhagic Septicemia.

References

Textbooks

1. Banerjee, G.C., 2006. Text book of Animal Husbandry 8thEd.Oxford and IBH Publishing Company Ltd., New Delhi.
2. ICAR, 2013. Hand book of Animal Husbandry, 4thEd.ICAR Publication, Pusa, New Delhi.
3. Jagadish Prasad, 2002. Principles and practices of Dairy Farm Management, 3rd Ed. Kalyani Publishers, Ludhiana.
4. Ranjhan, S.K., and N.N.Pathak, 2003. Text book on buffalo production, 4 Ed. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Sastry, N.S.R., C.K.Thomas and R.A.Singh, 2015. Livestock Production Management, 4thEd.Kalyani Publishers, New Delhi.

Semester I

18DPTV0106 - Practical I (Credits 3)

DAIRY HUSBANDRY PRACTICES

1. Identification of breeds of cattle
2. Identification of breeds buffalo
3. Study of reproductive organs of cow
4. Study of reproductive organs of bull
5. Heat detection in dairy cow
6. Demonstration of semen collection
7. Demonstration of semen evaluation
8. Handling of LN_2 containers
9. Hands on training in Artificial insemination
10. Preparation of plans for animal housing
11. Record keeping in dairy farm
12. Visit to frozen semen bank
13. Preparation of project for starting a dairy farm

Semester I

18DPTV0107 - Practical II (Credits3)

ZOOTECHNY

1. Points of Dairy Cattle, Buffalo and Bull
2. Handling of dairy cattle
3. Cattle head restraint techniques
4. Cattle limb restraint techniques
5. Restraining of calves
6. Casting of cattle
7. Hands on training in disbudding of calves
8. Tattooing
9. Ear tagging
10. Dentition and ageing
11. Estimation of body weight by body measurement
12. Hands on training in grooming
13. Castration of bull calves
14. Transportation of cattle

Semester I

18DPTV0108- Practical III (Credits3)

DAIRY CATTLE MANAGEMENT

1. Care of newborn calf
2. Care of Heifers
3. Care of pregnant cows
4. Care of cow at the time of calving
5. Hands on training in hand milking
6. Hands on training in machine milking
7. Oral administration of solid and liquid medicine
8. Hands on training in deworming
9. Hands on training in vaccination
10. Identification and control of ectoparasites
11. Visit to veterinary Hospital
12. Study on first aid kit and practice on first aid to burns and scalds of cattle
13. First aid to mastitis
14. Recording of Temperature, pulse and Respiration

Semester I

18DPTV0109 – EXPERIENTIAL LEARNING I (Dairy Farm Training)(Credits 4)

Objective

To provide practical exposure on managing a dairy farm

Learning Outcome

- Students will attain practical knowledge by performing assigned work.
- Students will learn to manage the cattle that infected with diseases and during pregnancies.
- Students will learn documentation at farm level
- Students will get to know about the fodder and management of fodder produced.
- Students will gain knowledge on marketing of farm milk.

Work Plan

Students have to undergo Experiential learning at GRI dairy farm and a private sector dairy farm. They have to study and gain skills on managing dairy farm, fodder production, feed formulation and dairy cattle. They have to gain knowledge on the following exercise at dairy farm. Also students are admitted to maintain and manage the farm activities, carry out collection of milk and sales of collected milk.

Cattle management

1. Recognize different cattle and buffalo breeds
2. Calculate feed and fodder requirement for different classes of animals
3. Vaccination of animals
4. First aid and treatment of basic health problem
5. Diagnose heat period
6. Artificial insemination techniques and pregnancy diagnosis
7. Assisting the animal during partutrion
8. Removal of retained placements

Farm management

1. Maintenance of dairy equipments
2. Milk collections and transportation
3. Establishing dairy farm
4. Maintenance of stores for dairy farms and dairy plants

5. Maintaining of records and registers
6. Advertisement for dairy farms and dairy plant
7. Conducting farmers training
8. Techniques for improvement of milk production
9. Techniques in disposal of farm waste
10. Raising of calves, heifers
11. Disposal of dead animals
12. Transportation of semen.

Fodder production and management

1. Production of fodder crops
2. Planning and layout of dairy farms
3. Formulation of cattle feeds

Assessment

Students who underwent the experiential learning should submit a report based on the daily routine activities that performed by them at the farm with the details of date and timing. After the successful completion of experiential learning at farm the evaluation will be done on the basis of following criteria.

Evaluation of Experiential Learning Programme

S.No.	Parameters	Max. Marks
1.	Project Planning and Writing	10
2.	Presentation	10
3.	Regularity	10
4.	Monthly Assessment	10
5.	Output delivery	10
6.	Technical Skill Development	10
7.	Entrepreneurship Skills	10
8.	Business networking skills	10
9.	Report Writing Skills	10
10.	Final Presentation	10
	Total	**100**

SEMESTER - II

Semester II

18DPTV0210 -RURAL RESOURCE APPRAISAL (Credits 5)

Objective

- To learn the real dairying situation at rural level
- To know the status of animal husbandry at village level
- To know the milk production details at village level

Learning Outcome

- Students will get expose to the current scenario of dairy in rural and urban area.
- Students will acquire knowledge about the health, maintenance and various milking practices carried out in farm.
- It provides practical knowledge to students by engaging themselves in field work.

Work Plan

The students should get exposed to field experience through Rural Resource Appraisal programme. Students will stay with farmers in a village and study the agro dairy practices carried out by the farmer. A separate record note book should be submitted by the students to record the socioeconomic status of farmers, dairy farming system, livestock production, cattle population, animal feeding methods, animal health awareness, milking practices, milk production, sale and economic details, clean milk production, milk consumption and value addition in the sample field selected by the students. The evaluation will be made purely on internal basis by the course teacher.

Tools used may be survey by questionnaire, interview schedule and PRA techniques.

Semester II

18DPTV0211- MILK HYGIENE AND PUBLIC HEALTH (Credits 4)

Objectives

- To discuss the importance of hygiene and sanitation of milk handling at different levels
- To explain public health administrative set up in Centre- State-District-Block- village levels.

Learning Outcome

- Students will attain knowledge on various sources of contamination.
- Students acquire knowledge on various hygiene practices to be carried out in farm.
- Students will come to know about importance of cleaning and sanitization and CIP.
- It provides information about the public organizations involved in hygiene practices.

Unit I : **Maintenance of hygiene and sanitation at dairy farm premises:** Sanitizers: definition – types – heat, chemicals, UV and Bio Detergents – its application to dairy farm premises. Disinfectants: definition – natural disinfectants and chemical disinfectants- applications to dairy farm premises. Hygienic handling / management of dairy equipments: principles of cleaning and sanitation – ideal properties of detergents and sanitizers – methods of cleaning dairy equipments – tests of sterility. Hygiene control in milk chilling centers.

Unit II : **Package of hygienic practices at farm level:**Animal hygiene - milker hygiene- utensils/equipment hygiene- hygiene during milking process - environmental hygiene.Sources of contamination of milk.Diseases Transmitted Through Milk - Classification of milk Borne Diseases.

Unit III : **CIP**: Expansion – definition – application of CIP in food industry. CIP – Dairy Industry. CIP applicable dairy machineries. Selection and use of dairy cleaners and sanitizers. Various chemicals used for CIP of dairy plant. Types of cleaning. Cleaning procedure. Cleaning efficiency.

Unit IV : **Historical development of public health:** Changing concepts of public health. Various committees on health development in India. Public Health set up at State- District – Block - Sector - Village level -organization-functions. Public Health Laws - Definition – importance – Statutory laws -The Tamil Nadu Public Health Act.

Unit V : **Animal products safety:** Indian scenario, role of veterinarians in milk hygiene and public health. Pesticide residues in milk and milk products. Heavy metal contamination in milk and milk products. Drugs, drug resistance, toxicity, allergy - safe use and precautions.

References:

Text books:

1. Anantha Krishnan, C.P., (1991), Technology of milk processing, Sri Lakshmi Publications, Chennai -10.
2. Britz, T.J. and Robinson, R.K 2008. Advanced Dairy science and Technology. 1st ed, BackwellPubl.Ltd., UK.
3. Harry S. Mustard.,(1960) An Introduction to Public Health, The Macmillan Co., New York.
4. Sukumar De (1980), Outlines of Dairy Technology, Oxford University Press, New Delhi
5. V.K.Muthu., (2005) A Short Book of Public Health, , JAPEE Brother Medical Pub.(P)Ltd New Delhi.
6. Walstra, P. Wouters, J.T.M. and Geurts, T.J. 2006. Dairy Science and Technology. CRC Press, New York.

Semester II

18DPTV0212 -MILK PROCUREMENT (Credits 3)

Objectives

- To discuss the concept and importance of milk procurement
- To provide knowledge on methods and techniques of milk procurement, milk transport and distribution.

Learning Outcome:

- Students will learn on various historical facts which are important for dairy development.
- Students get to know on various activities like collection, pricing, distribution and transportation of milk to chilling centers.

Unit I : **Introduction:** Status and importance of milk procurement in India and Tamilnadu. Milk procurement and pricing pattern in India.

Unit II : **Milk production:** Principles of milk production- selection of milk shed area – milking practices - milk handling.

Unit III : **Milk procurement:** Source of milk procurement – classification. Organization of rural milk procurement. Collection of milk – definition - classification- methods, milk collection centers and their functions.

Unit IV : **Transportation of milk:** Modes of transport – earlier methods – recent developments – selection of mode of transportation of milk.

Unit V : **Distribution of milk:** Importance – raw milk distribution – attribution of pasteurized milk – bulk distribution – retail distribution of pasteurized milk – consideration for organizing and distribution.

References:

Text books:

1. Dairy India year book 2007 & 2017, A- 25 Priyadarshinivihar, Delhi 110092, India.
2. Jagadish Prasad (1992), Principles and Practices of Dairy Farm Management, Kalyani Publishers, Ludhiana.
3. Ramasamy. D. 1999. Dairy technologist hand book, International book distributing Co. Luknow.

4. Robinson (1986), Modern Dairy Technology, Vol.I, Advances in Milk Processing, Chapman and Hall India, Madras.
5. Sukumar De (1980), Outlines of Dairy Technology, Oxford University Press, New Delhi
6. Walstra, P. Wouters, J.T.M. and Geurts, T.J. 2006. Dairy Science and Technology. CRC Press, New York.

Semester II

18DPTV0213 - DAIRY ENGINEERING -I (Credits 2)

(REFRIGERATION AND CHILLING EQUIPMENT)

Objective

- To understand the principles of Refrigeration.
- To obtain knowledge on working at chilling plant.
- To gain skills on repair and maintenance of refrigeration and cooling unit.

Learning Outcome

- Students acquire knowledge on types of refrigeration cycles
- Students will learn the process of refrigeration
- Students will learn on various tools and equipments involved in chilling process
- Students get practice on working of BMC and chilling centre and also cleaning and sanitation process of BMC.

Unit I : **Introduction:** Basic refrigeration cycle and concepts, standard rating of refrigerating machines: Air Conditioning – Importance of refrigeration in dairy industry. Methods of refrigeration: Units of refrigeration

Unit II : **Refrigeration cycles:** Different types of refrigeration cycles- Vapour compression refrigeration system –compressors, condensers and evaporators – types of evaporators – block diagram of vapour compression refrigeration system – desirable characteristics of refrigerants – properties of refrigerants and comparison.

Unit III : **Refrigeration plant and control devices:** Automatic expansion valve – solenoid valve- pressure control and thermostat. Common troubles in refrigeration system. Cooling tower. Ice bank systems. Factors affecting the performance of refrigeration plant- Efficient use of refrigeration.

Unit IV : **Refrigeration in milk processing:** Mode of transportation of milk tankers, Bulk milk cooler – construction and operation, Chilling plant – construction, hygiene and sanitation, safety precaution at cold storage, types of chillers, tests to check leakage of refrigerants – bubble test, halide torch test, nesseler's reagent test, sulphur candle test, electronic test detector, Merits and demerits of refrigeration in milk.

Unit V : **Care and maintenance:** Cleaning and sanitation of BMC and chilling plant, precaution to be taken by workers, factors affecting refrigeration.

References

Textbooks

1. GostaBylund (1995), Dairy processing hand book, Tetra pak processing systems AB, Swedwn
2. James. N. Marner (1975), Principles of dairy processing, wiley eastern limited, New Delhi.
3. Ramasamy D, 1999. Dairy Technologists Hand Book, International Book Distributing Co, Lucknow
4. Sukumar De 1980, Outlines of Dairy Technology. Oxford University Press, New Delhi.
5. Tuffel Ahmad 1995, Dairy Plant Engineering and Management, KitabMachal Distributers, New Delhi

Semester II

18DPTV0214 - DAIRY CHEMISTRY (Credits 2)

Objectives

- To understand the physiochemical components present in milk
- To study the structure, role, and chemical interactions of milk

Learning Outcome

- Students will gain knowledge on various components present in milk.
- Students will acquire knowledge on various physical and chemical properties of milk.
- Students will learn various methods to analysis the proximate composition of milk.

Unit I : **Composition of milk**: Milk - definition – Gross composition of milk (cow, buffalo, goat, sheep and human) - Nutritive value of milk and energy calculation. Colostrum: composition – importance of colostrum. Factors influencing the composition of milk. Factors affecting quality of milk yield. Physical properties of milk.

Unit II : **Milk Carbohydrates**: Definition, classification, Lactose structures, physical forms, status of lactose in milk, uses of lactose.

Unit III : **Milk fat:** Definition, composition and size of fat globules, fat soluble vitamins, phospholipids. Properties of milk fat- density, Refractive index, Iodine value, RM value, Polenske value, Saponification value.

Unit IV : **Milk Proteins:** Classification, isolation, major and minor milk proteins – Properties of milk proteins – hydration, solubility.

Unit V : **Minor constituents:** Definition, types of enzymes - functions – influence of processing parameters and effect on storage. Minerals and vitamins of milk: distribution of major minerals in milk- trace elements in milk.

References:

Text books:

1. Eeckles.CH.Combs, W.B and Macy.H (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd., New Delhi.

2. Mathur MP, Roy DD and Dinakar P.1999. *Textbook of Dairy Chemistry*. ICAR.
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5. Webb, B.H., Johonson, A.H., and Alford, J.A. (Eds) (2008). Fundamentals of Dairy Chemistry, CBB Publishers and Distributors, New Delhi.
6. Wong N.P, Jenness.R. Keeney.M. Marth E.H (1998); Fundamentals of Dairy Chemistry, CBB Publishers and Distributors, New Delhi.

Semester II

18DPTV0215- DAIRY MICROBIOLOGY (Credits 2)

Objective

- To understand about various microbes and their characters
- To understand on merits and demerits of microbes in field of dairy
- To gain knowledge on various test for estimation of microbes

Learning Outcome

- Students will learn various microbes, their characters and taxonomy nomenclature.
- Students will learn about various methods to detect the microorganisms.
- Students will get knowledge about importance of microbes in dairy processing.

Unit I : **Introduction to Microbiology:** Classification of bacteria– major characteristics – Prokaryote and Eukaryote – aerobes and anaerobes – Microbial Taxonomy – Nomenclature and classification of bacteria – fungi.

Unit II : **Microbiology of Milk:** Introduction, Types of micro-organisms present in milk, Milk borne diseases (pathogens), Microbial standards of raw and pasteurized milk, Microbial spoilage of milk, Role of microbes in dairy, Fermentation process and control.

Unit III : **Microbial spoilage of milk:** Physiological grouping; acid producers, gas producers, proteolytic, lipolytic, sweet curdling, ropiness, flavour producing, colour fermentations.

Unit IV : **Microbiology of milk products:** Spoilage of milk products – FSSAI standards – Grading

Unit V : **Bacteriology of starter cultures:** Definition – types of starters, Classification of starter culture- function- propagation-preservation methods-factors affecting activity of starter cultures – role of starter in dairy fermentation –characteristics of good starter culture.

References:

Text books:

1. Fernandes, R.2009 . Microbiology Hand book: Dairy Products. Royal Society of Chemistry, Revised ed., London
2. Foster E.M (1957) Dairy Microbiology, Prentice Hall Inc, USA.
3. Mani. A., A.M. Selvaraj, L.M. Narayanan, N.Arumugam, Microbiology (General and Applied), Saras Publication, A.R.P. Camp road, Periavilai, Kottar (PO), Nagercoil, KanyakumariDist – 629 002.
4. Pelczar.Reid and Chan, 1977 - Microbiology, Tata McGraw-Hill Publishing company Ltd., New Delhi.
5. Ramasamy, D., 1999, Dairy Technologist's Hand Book, International book distributing Co., Lucknow.
6. Srivastava.L. (2002)., Hand Book of Milk Microbiology, Daya Publishing House, Delhi.
7. Yadav, J.S. (1993) A Comprehensive Dairy microbiology, Metropolitan Book Co. Pvt Ltd, 1, NetajiSubashMarg, New Delhi-11002, India.

Semester II

18DPTV0216- PRACTICAL IV (Credits 3)

(DAIRY CHEMISTRY)

Objectives

- To practice on methodology of sampling
- To practice on various methods to detect the composition of milk
- To practice on platform test

Learning Outcome

- Students will gain practical knowledge on proximate, adulterants and preservatives in milk.
- Students will gain knowledge on handling of equipments and devices in chemical analysis.

1. Sampling of milk for physical and chemical examination
2. Platform tests for milk
3. Sediment test
4. Clots on boiling
5. Determination of specific gravity of milk by lacto meter
6. Fat test by Gerber's method
7. Fat test by milkotester
8. Fat test by milk analyser
9. Estimation of TS,SNF
10. Determination of titratable acidity in milk
11. Detection of adulteration in milk
12. Detection of preservatives in milk
13. Alcohol test

Semester II

18DPTV0217- PRACTICAL - V (Credits 3)

(DAIRY MICROBIOLOGY)

Objective

- To get knowledge on various equipments used in microbiology laboratory
- To gain practice on various microbial tests

Learning Outcome

- Students will gain practical knowledge on handling of microbial equipments
- Students will get practiced on various microbial analysis

1. Familiarity with common equipments used in microbiology lab
2. Handling of microscopes.
3. Cleaning and sterilization of glasswares
4. Preparation of dilution blank,agar plates and agar slants
5. Preparation of various agar.
6. Gram staining techniques.
7. Methylene blue reduction(MBR) test
8. Resazurin Test
9. Standard Plate count test(SPC)
10. Direct microscopic (DMC) test
11. Coliform count
12. Yeast and Moulds

Semester II

18DPTV0218 - INPLANT TRAINING (Credits 6)

(CHILLING CENTRE)

Objective

- To provide practical exposure in refrigeration and chilling operations in milk chilling centre

Learning Outcome

- Students will attain practical knowledge by performing assigned work.
- Students will learn to operate RMRD, chilling unit and BMC.
- Students will learn documentation of milk at reception unit.

Work Plan

Students have to undergo In-Plant training in milk collection and chilling centre and they have to study and gain skills on repair/ maintenance of various equipments and machineries and they have to gain knowledge on the following operations of chilling plant.

1. Reception of milk –collection of milk at reception dock.
2. Sampling milk- labeling of sample and storing for analysis
3. Quality analysis at reception dock – platform tests
4. Can washers – sanitizing solution preparation
5. Study the filters and clarifiers arranged in reception.
6. Chiller
    a. Parts of chillers
    b. Dismantling of chiller plates
    c. Assembling of chiller plates
7. Study the flow of milk through chiller
8. Study of cream separator and parts-assembling
9. Study the refrigeration section
    a. Compressor
    b. Evaporation coil
    c. Fixing pipe flow lines
    d. Installation at chilling plant
10. Study on refrigeration control devices

11. BMC
    a. Construction
    b. Temperature gauge
    c. Pressure gauge
    d. Insulation
12. Documentation and record keeping
    a. Process parameters
    b. Quantity and quality of milk and storage
13. Study on malfunction of
    a. Can washers
    b. Chiller
    c. BMC
14. Calibration of equipments and gauges-
15. Cleaning and sanitizing
    a. Preparation of solutions
    b. Procedure for cleaning and sanitization of process area
    c. Procedure for cleaning and sanitation of BMC and chilling section
    d. Maintenance of personal hygiene
    e. Check for sources of contamination
16. Safety precaution
    a. Check for safety measurements
    b. Check for leakage of refrigerant
17. Calculation of ton of refrigeration
18. Exercise on checking leakage of refrigerants – bubble test, halide torch test, nesslers reagent test, sulphur candle test ,electronic test detector

Assessment

Students who underwent the In-Plant training should submit a report based on the daily routine activities that performed by them in the chilling centre. Also, they should submit report on the daily activities that they carried out with the details of date and timing. After the successful completion of In-Plant training an examination along with a viva voce will be conducted and evaluated.

SEMESTER - III

Semester III

18DPTV0319 ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

(Credits 4)

Objectives

- To learn the importance in conservation of environment and natural resources
- To learn causes effects and control measures of environment pollution
- To understand the concepts of disaster management and preparedness to overcome

Learning Outcome

- Students will learn about the importance of environment and ecosystem.
- This course provides knowledge about the social issues and management of disaster.

Unit I : **Natural resources :** Introduction to environment and natural resources (definition, scope and important) - forest resources: use and over-exploitation of forest resources and its impact on forest and tribal people-Water Resources : Use and over – exploitation of water and impact – Land degradation and soil- erosion, desertification-Food resources: Effects of modern agriculture, fertilizer- pesticide problems-energy Resources: Growing energy needs renewable and non renewable energy source-use of alternative energy sources.

Unit II : **Ecosystem and Biodiversity:** Concept of an ecosystem-structure and function of an ecosystem – energy flow in the ecosystem –Food chains, food webs and ecological pyramids- types of ecosystem- Biodiversity: genetic, species and ecosystems diversity, India as a mega- diversity nation –treats to biodiversity: habit loss, poaching of wild life, man-wild conflicts; Endangered and endemic species of India – Conservation of Biodiversity: I-Situ and Ex-Situ conservation of biodiversity.

Unit III : **Environmental Pollution:** Causes, effects and control measure of Air Pollution, Water pollution, Soil Pollution, Noise Pollution and Nuclear hazards, Solid waste management, Global environmental problems.

Unit IV : **Social Issues and the Environment**: Sustainable development, Rural Urban problems related to environment, Water management and rain water harvesting – Environment ethics: Issues and possible solutions, Environmental Protection Policy, Acts and Legislation, Population and the Environment – Environmental and Population concern: Environment and human health, Environment education at various levels.

Unit V : **Disaster Management:** Disaster: Meaning and concepts, types, cause and management –Effects of disaster on community, economy, environment-Disaster management cycle: early response, rehabilitation, reconstruction and preparedness- vulnerability Analysis and role of community in Disaster Mitigation-The Disaster Management Authority: National, state and District level –III effects of fireworks

References:

Text books:

1. A text book of Environmental Studies , 2005, ErachBharueha, UGC, University press, New Delhi.
2. A text book of Environmental Studies, 2003, Thangamani and Shyamala, PranavSynicate, Publication Division, Sivakasi
3. A text book of Environmental Studies, 2006, Asthana,D.K., MeeraAsthana, S. Chand & Company Ltd., New Delhi.
4. Environmental Studies, 2005, Benny Joseph, Tata Macgraw – Hill Publishing Company, New Delhi
5. Panchayats in Disaster: Preparedness and Management, 2009, palanithurai, G., Concepts Publishing company

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Semester III

NSS (Credit 1)

Objectives

- To know the history, philosophy, principles of NSS and working with people
- To know the role and responsibility of volunteers.

Learning Outcome

- Student able to know to know the history, philosophy, principles of NSS and working with people, role and responsibility of volunteers.

Unit I : NSS - History, Philosophy, Principles and objectives

Unit II : Working with people— Methods and Techniques

Unit III : NSS - Regular Programme: objectives, activities - role and responsibilities of volunteers

Unit IV : **:** NSS Special Camping Programme: objectives, activities - role and responsibilities of volunteers

Unit V : Evaluation of the NSS activities - Tools and Techniques

References:

Text books:

1. Advi Reddy, 1996, Extension Education Babatal Publications, Hyderabad
2. Narayanasamy, N, M.P.Boraian and R. Ramesh, 1997, Participatory Rural Appraisal, GRU, Gandhigram.
3. National Service Scheme Manual1 1997. Department of Youth Affairs and Sports, Ministry of Human Resource Development, Government of India.
4. Supe, S.V. 1995, Extension Education, Sterling Publications, Madras

Semester III

SHANTI SENA (Credit 1)

Objectives

- To introduce the Concept of Shanti Sena (Peace Brigades) to the students.
- To give exposure and training to students in the skills needed for Shanti Sena.

Learning Outcome

- Student will learn concept of SanthiSena and acquire skill on santhisena

Unit I : Shanti Sena- Meaning and conceptual frame work - historical development

Unit II : Shanti Sena in India and abroad- Contributions of Mahatma Gandhiji, Khan Abdul, Ghaffar Khan, VinobaBhave and Jeyaprakash Narayan

Unit III : Organisation and functions of Shanti Sena- Shanti Kendras, All India ShanthiSenaMandal; Peaceful resolution of conflicts, Peace Making, Alternative to Defense and Violence.

Unit IV : Experiments in Modem times- World Peace Brigade, Peace Brigade International, U.N. Peace Keeping Force, Truth and Reconciliation Commission and Experiments of Gandhigram Rural Institute

Unit V : Skills and Training for Shanti Sena- Skills of First Aid and Skills for management, Peace Making Skills(Conflict Resolution and Counseling Transforming oneself into a ShandSaink.

References:

Text books:

1. Dr.N.Radhakrishnan, (1997), Gandhian Nonviolence: A Trainees Manual, GandSmiriti and DarshanSamiti, New Delhi.
2. K.Arunachalam (1985), Gandhi - The Peace Maker, Gandhi SmarakNidhi, Madurai

Semester III

SPORTS AND GAMES (Credit 1)

Objectives

- To acquire basic knowledge of Physical Education
- To know the rules and regulations of sports and games
- To acquire knowledge about recreation
- To spread the message of positive health as taught in Yoga to people in a systematic and scientific manner
- To provide a proper perspective and insight into various aspects of Yoga education to the trainees.

Learning Outcome

- Students able acquire basic knowledge of Physical Education, know the rules and regulations of sports and games, acquire knowledge about recreation, spread the message of positive health as taught in Yoga to people in a systematic and scientific manner, provide a proper perspective and insight into various aspects of Yoga education to the trainees.

Unit I : Concept and meaning of Physical Education- Definition of Physical Education- Aims and Objectives of Physical Education- Scope of Physical Education

Unit II : Origin of games(basket ball, ball badminton, cricket, foot ball, hockey, kabaddi, khokho, Tennikoit, Volley ball)- Basic skills of anyone of the major games (basket ball, Volley ball, kabaddi and foot ball etc.,) and two events Track and Field events-Intramural and Extramural tournaments- Recreational activities

Unit III : Common athletic injuries and their treatment personal hygiene- safety education with special reference to play field- modem trends in Physical Education- Counseling against doping, drug addiction, smoking, alcoholism- nutrition and sports diet

Unit IV : Meaning of Yoga- Definition of Yoga- Aims and OBJECTIVESS of Yoga- Scope of yoga-Need and Importance of Yoga in the modern era.

Unit V : The wheel of Yoga-Eight limbs of yoga - Gandhiji's contribution of Yoga Meaning and objectives of Meditation - various types of meditation - Difference between yoga and Physical Exercises - Therapeutical aspects of yoga and its applications.

References:

Text books:

1. Competition Rules Book by Amateur Athletics Federation of India, New Delhi, 2003,
2. Essential of Physical Education by Dr. Ajmeer Singh, Xpress Grafics, Delhi-28, 2003.
3. Officiating Techniques in Track and Field by BrarT.S. Gwalior, 2002,
4. The Official Rules book of Basketball, Football, Hockey, Volleyball, Kabaddi Federation of India, 2015.

Semester III

FINE ARTS (Credit 1)

Objectives

A general survey course to introduce the students to Indian Art.

- To understand the basics of Art History, Aesthetics and Art Appreciation.
- Theoretical, social and cultural dimensions of the production of art and architecture.

Learning Outcome

- Student will acquire knowledge and skill on Indian art, history and aesthetics, Indian architecture and Trends and development of Indian architecture.

Unit I : **Art History and Aesthetics:** What is art and what is art History? What constitutes art and how do we define it? The Classical Concept of art. Theory of Art as Expression. Aesthetic theories of Art.

Unit II : **Indian Art:** Do art and architecture perform functions and have a role to play in society? The role and importance of the museum as a site for cataloguing and preserving art, and projecting certain defined notions that have a bearing on the study of art and architecture will also be focused upon

Unit III : **Indian Architecture:** Prescriptive texts and the making of early Indian art and architecture. Was the science' of art and architecture developed as a concomitant of the artistic and architectural developments in early India?

Unit IV : **Typesof Architecture:** Domestic (dwellings), public institutional (step-wells, rest-houses, hospitals) and religious institutional will be focused upon. The focus will be on the material sources at particular monument sites such as Sanchi, Amaravati, Ajanta, Ellora, Khajuraho, Tanjavur, Mahabalipuram, SravanaBelagola, Bhubaneshwar and Mount Abu. (There may be other sites added or dropped from this list depending on the newer literature available.)

Unit V : **Trends and Developments:** How do we understand the different structures that emerge over a long period of time within a monument or when a monument no longer has a living significance for the people in its vicinity?

Are symbols remnants of the primitive mentality or do they also evolve over time? How do we understand ornamentation? Finally, is there an Indian art and architecture?

References:

Text books:

1. Brancaccio, Pia (2011) The Buddhist Caves at Aurangabad: Transformations in Art and Religion. Leiden & Boston: Brill.
2. Brockman, Norbert C. (2011) Encyclopedia of Sacred Places. Vol. 1: A-M. Second Edition, California: ABC-CLIO, LLC,
3. Burton-Page, John (2008) Indian Islamic Architecture. Forms and Typologies, Sites and Monuments. Ed. George Michell. Leiden & Boston: Brill.
4. Elgood, Heather (2000) Hinduism and the Religious Arts. London & New York: Cassell.
5. Tillotson, GHR, Paradigms of Indian Architecture: Space and Time in Representation and Design, Curzon, 1997,
6. Vatsyayan, Kapila, The Square and the Circle of the Indian Arts, Abhinav., Delhi, 1997.
7. Wagoner, Philip B., 'Ananda K. Coomaraswamy and the Practice of Architectural History', Journal of the Society of Architectural Historians, vol. 58, no. 1, 1999.

Semester III

COMPUTER FUNDAMENTALS AND OFFICE AUTOMATION (Credits 4)

Objectives

- To understand the basic concepts of computers
- To develop applications using MS Word, MS excel and MS Power point
- To acquire knowledge on hardware devices

Learning Outcomes

1. Students will get train on handling the computers and hardware
2. Students get knowledge on operating systems and Ms Office which will be useful in dairy processing plant.

Unit I : **Computer concepts:** definition of a computer – origin of computer-characteristics-computer terminologies- Anatomy of a computer- generations of computers –types of computers – types of operation system –types of programming languages- Assembler- translator – Compiler – cross complier-Discussion on recent trends and technology

Unit II : **Hardware devices**-Input devices – key board – mouse –pointing devises-output devices – printers-plotters-monitors-Storage devices – floppy-Compact disk-external Hard disk- pen drive- Flash Drive-Source data entry devices-Digital camera- Scanners- Voice recognition System- fax machine- microphone-Surprise test/slip test

Unit III : **MS-Word-** introduction- features- Document creation – Document editing : cursor movements –Selection text – copying text – moving text – Finding and replacing text- Spelling and Grammar- page setup – Table creation-Mail Merge-Test on MS word shortcut keys

Unit IV : **MS-Excel-** introduction- Advantages and applications- Organization of work book – Editing a worksheet- Range – Formatting work sheet – Chart: creation – changing type- print options Built-in functions- Test on Excel Functions

Unit V : **MS-Power Point**- introduction- features-Creating presentation-viewing-saving

and close presentation-Changing Layout – Changing Designs- Slide transition-Adding animation effects- Inserting table, charts ,pictures clipart in presentation-Checking the creativity of Students

References:

Text books:

1. Fundamentals of information technology, S.K.Banasal, A.P.H. Publishing company, Newdelhi – 2002.
2. 2007 Microsoft office system step by step, Joyce Cox ,JoanPreppernau, Steve Lambert and Curtis Frye,2007.

Semester III

18DPTV0320-GENERAL LABORATORY PRACTICES (Credits 2)

Objectives

- To acquaint the students about the basics of commonly used techniques in laboratory
- To practicing the handling techniques of laboratory instruments used for analysis of milk and milk products.

Learning Outcomes:

- From this course, students will get well trained on handling of various equipment and devices in laboratory.
- Students will learn on calibration of various equipments and devices.

1. Practice the general laboratory procedures, care and maintenance of research equipments and safety measures while in lab.
2. Preparation of buffers
3. Determination of pH using pH meter.
4. Practicing and handling of centrifuge and water bath.
5. Practicing and handling of viscometer and flame photometer.
6. Practicing and handling of calorimeter.
7. Practicing and handling of different types of microscope and colony counter.
8. Practicing and handling of autoclave and muffle furnace.
9. Practicing and handling of laminar air flow chamber and Incubator.
10. Practicing and handling of hot air oven and micro oven.
11. Practicing and handling of advanced lab equipments for estimation of milk constituents in dairy products.
12. Handling of Soxoplus
13. Handling of Kelplus
14. Handling of Fibroplus

References:

Text books:

1. Furr AK. 2000. CRC Hand Book of Laboratory Safety. CRC Press.
2. Gabb MH &Latchem WE. 1968. A Handbook of Laboratory Solutions.Chemical Publ. Co.
3. Settle F.1997. Handbook of Instrumental Techniques for Analytical Chemistry. Hall International.

Semester III

18DPTV0321 - DAIRY ENGINEERING II (Credits3)

(STEAM AND STEAM BOILER)

Objectives

- To acquire knowledge on construction of boilers, parts and tools
- To study the theory of heat transfer and formation of steam

Learning Outcomes

- Students get to know about the construction of boilers and its accessories.
- This course provides information about the importance and application of steam.
- Students will get knowledge on various types of boilers.

Unit I : **Steam and steam generators:** Wet, dry and superheated steam; Formation of Steam, dryness fraction, internal energy and enthalpy; use of steam tables.

Unit II : **Boilers:** Classification of boilers; constructional features and operations of vertical fire tube, horizontal return flue and automatic boilers.

Unit III : **Parts of boiler:** Boiler mountings, accessories and their uses. Scaling of boiler and water treatment plant.

Unit IV : **Thermodynamics:** Total Heat (or Enthalpy) of Water, Latent Heat of Steam, Dryness Fraction, Wetness Fraction, Total Heat (or Enthalpy) of Wet Steam, Total Heat of Superheated Steam, Advantages of Superheating Steam, Determination of Dryness Fraction of Steam; Type of Steam.

Unit V : **Performance of Boilers** - Equivalent Evaporation, Factor of Evaporation, Boiler Efficiency, Efficiency of Economiser, Boiler Horse Power, Heat Losses in a Boiler, Heat Balance Sheet of a Boiler, Methods of Minimising the Heat Loss through Different sources, Trickling filter model, Design of an aerated tank without recycle, Design of trickle filter system.

References:

Text books:

1. GostaBylund (1995), Dairy processing hand book, Tetra pack processing systems AB, Swedwn

2. James. N. Marner (1975), Principles of dairy processing, wiley eastern limited, New Delhi.
3. Sukumar De 1980, Outlines of Dairy Technology. Oxford University Press, New Delhi.
4. Tuffel Ahmad 1995, Dairy Plant Engineering and Management, KitabMachal Distributers, New Delhi

Semester III

18DPTV0322 - DAIRY TECHNOLOGY – I (Credits 3)

(MARKET MILK)

Objectives

- To provide the knowledge about the liquid milk processing and preservation.
- To enlighten the students about the market available processed/special milk.

Learning Outcomes

- Students gain knowledge about types of market milk available in market and their importance.
- This course provides details about the manufacturing process of different market milks.
- Students will learn about the process flow of market milk and difference between manufacture milk.

Unit I : **Market milk** – definition – Status of market milk industry in India and abroad –Indian standards – State wise standards.

Unit II : **Primary processing -** Pasteurized milk –definition –objectives- types of pasteurized milk – method of preparation –storage – purpose – merits and demerits. Homogenized milk – definition – factors influencing homogenization – method of manufacture of homogenized milk- storage – purpose – merits and demerits.

Unit III : **Standardization -** Scope, definition, standards, method of preparation, storage and nutritional value of Standardized milk – Toned milk – Double toned milk – Full cream milk- Skimmed milk – Recombined milk – Reconstituted milk.

Unit IV : **Value added milk -** Scope, definition, standards, types, method of preparation, storage and nutritional value of Sterilized milk – Flavoured milk – UHT processed milk – MF and UF milk – Vitaminised/irradiated milk – Mineral fortified milk – Filled milk – Soft curd milk.

Unit V : **Modified milks -** Humanized milk: Low fat milk – lactose free milk - Designer milk: definition –objectives- method of preparation – purpose – merits and demerits – nutritional value and therapeutic benefits.

References:

Text books:

1. Anantha Krishnan, C.P., (1991), Technology of milk processing, Sri Lakshmi Publications, Chennai -10.
2. Dairy India year book 2007 & 2017 A- 25 Priyadarshinivihar, Delhi 110092, India.
3. Eeckles.CH.Combs, W.B and Macy.H (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd., New Delhi.
4. Ramasamy. D. 1999. Dairy technologist hand book, International book distributing Co. Luknow.
5. Robinson (1986), Modern Dairy Technology, Vol.I, Advances in Milk Processing, Chapman and Hall India, Madras.
6. Sukumar De (1991), Outlines of Dairy Technology, Oxford University Press, New Delhi.

Semester III

18DPTV0323-MILK PROCESSING AND PRESERVATION (Credits 3)

Objectives

- To enable the students to acquire skill in processing of milk
- To gain knowledge on various methods of milk processing.

Learning Outcomes

- This course provides details about various process involved in reception area and processing area.
- Students will get knowledge on various process including pasteurization, standardization and cream separation
- Students will learn about various equipments such as pasteurizer, homogenizer, cream separator, clarifier and filters

Unit I : **Milk reception** – concept – unloading– sampling – basics involved in platform test – weighing, measuring and recording. Staining - filtration and clarification of milk - mechanism.

Unit II : **Preservation:** Definition - types of milk preservation. Chilling – meaning - methods of chilling – - importance of milk chilling - merits and demerits – Cold storage chain.

Unit III : **Separation of milk**: working principle – types of separation - advantages and disadvantages - uses. Homogenization – definition – types – mechanism of homogenization – effect of homogenization on milk - merits and demerits - uses.

Unit IV : **Heat treatment of milk:** pasteurization – history – objectives of pasteurization – definition - types – mechanism – advantages and disadvantages. Boiling Vs pasteurization. Vacreation – definition - mechanism – advantages and disadvantages.

Unit V : **Sterilization** - concept – scope of sterilized milk - method of producing sterilized milk - types – mechanism. UHT milk processing. Stassanization milk process.

References:

Text books:

1. Anantha Krishnan, C.P., (1991), Technology of milk processing, Sri Lakshmi Publications, Chennai -10.
2. Eeckless C.H, W.B Combs and H.Mecy (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd. New Delhi.
3. Ramasamy, D (1999) Dairy Technologist's Hand Book, International Book distributing Co, Lucknow.
4. Sukumar De (1980) Outlines of Dairy Technology, Oxford University Press, New Delhi.
5. Walstra, P. Wouters, J.T.M. and Geurts, T.J. 2006. Dairy Science and Technology. CRC Press, New York.

Semester III

18DPTV0324 -PRACTICAL VI (Credits3)

(MARKET MILK)

Objectives

- To study about the various parts of boiler
- To learn about various processes involved in market milk

Learning Outcomes

- Students learn on various procedures for preparation of various market milk.
- Students gain knowledge on various parts involved in milk processing.

1. Study on parts of boiler and flow of steam
2. Study on procedure for cleaning of boiler
3. Preparation of pasteurized milk
4. Phosphatase test
5. Preparation of homogenized milk
6. Preparation of recombined.
7. Preparation of reconstituted milk.
8. Preparation of sterilized milk.
9. Preparation of flavored milk.
10. Turbidity Test
11. Standardization of milk
12. Modified test

Semester III

18DPTV0325- IN-PLANT TRAINING (Credits 6)

(MILK PROCESSING)

Objective

- Students have to undergo In-plant training at an established dairy unit and should learn about all the following procedure.

Learning Outcome

- Students will acquire practical knowledge by performing assigned work.
- Students will learn about various processes including pasteurizer, homogenizer, packaging section, cream separation, freezing, condensing and evaporation.
- Students will learn documentation and record keeping of all standards at various processes.

Work Plan

1. Reception
    a. Record milk inlet – RMRD section.
        i. Record the details of milk route and cans.
        ii. Weighing and fat percentage of inlet milk.
        iii. Study the flow of milk from RMRD to Silo – flow diversion valve – pump- sensors involved in process flow.
    b. Laboratory
        i. confirm the quality of received milk
        ii. analysis of proximate composition
2. Clean in Place
        i. Preparation of cleaning and CIP solutions and concentration.
        ii. Proper usage of cleaning and sanitizing solution.
        iii. Washing of milk cans and crates.
        iv. Understand CIP and study the process of CIP
3. Processing
    a. Pasteurizer
        i. Record the temperature and document the recorded temperature.
        ii. Study the inflow and outflow line of milk, steam and cold water.

iii. Practice on dismantling and arrangement of pasteurizer flow line.
iv. Study on accessories fitted to pasteurizer.

b. Homogenizer
    i. Record the inlet milk temperature, pressure and document the recorded values.
    ii. Study the inflow and outflow line of milk.
    iii. Practice on repairing, dismantling and arrangement of homogenizer.
    iv. Study on accessories fitted to homogenizer.

c. Standardization
    i. Learn the calculations of standardization process for preparation of various types of milk and milk products.

d. Cream separation
    i. Study on various parts of cream separator.
    ii. Cleaning and sanitize cream separator.
    iii. Dismantling and arrangement of cream separator.

e. Packaging
    i. Run the packaging machine
    ii. Learn about the construction of equipment.
    iii. Learn inlet and outlet flow of milk.
    iv. Calculate the package losses at processing time

f. Freezing
    i. Study on freezing process, freezing unit, cold storage.
    ii. Practice on operating ice-cream making machine and ageing tank.

Assessment:

Students who underwent the In-plant training should submit a report based on the daily routine activities that performed by them in the dairy processing unit. Also, they should submit report on the daily activities that they carried out with the details of date and timing. After the successful completion of In-plant training an examination along with a viva voce will be conducted and evaluated.

SEMESTER - IV

Semester IV

18DPTV0426- IT APPLICATION IN DAIRY INDUSTRY (Credits 4)

Objectives

- To make the students to be familiar with multimedia
- To enable the students with the knowledge of network, internet and its application to dairy industry

Learning Outcome

- Students will get to know about the involvement of computers in dairy processing.
- This course also provides the knowledge on various softwares used at dairy industry.
- Students will get to know about the automation processes in dairy field.

Unit I : **Information Technology:** Concept – Strength of IT – Importance of computerization in Dairy industry – IT application in dairying – ERP (Enterprise Resource Planner) application at Amul Dairy.

Unit II : **Special instruments for the dairy industry:** E-nose and E-tongue – concept - principles - applications in food industry. Sensors: Electrochemical sensors – Optical odor sensors. Robotics: features of robots – application of robots in Dairy and food processing operations

Unit III : **Dairy process modeling:** Introduction – Process modeling: Fundamentals of process modeling – deductive modeling – inductive or empirical modeling (advantages and Disadvantages) Kinetic modeling – Heat and mass transfer modeling – supervisory control and data acquisition (SCADA). CAD, SAP and CAM in dairy industry.

Unit IV : **Plant Automation:** Meaning & Definition – types of automation systems – fixed automation – programmable automation – flexible automation – integrated automation – necessity of automation advantages of automated systems.

Unit V : **Case Studies:** 1. System analysis for milk procurement and billing system, 2. Design for milk procurement and billing system. Database design for milk system.

References:

Text books:

1. Balagurusamy, E 2009. Fundamentals of Computer Tata Mcgraw – Hill, New Delhi
2. Britz.T.J and Robinson, R.K.(2001), Advanced Dairy Science & Technology, Bkachevell Publication, UK.
3. Rajan, E.G 2003 Information Tech. BS Publication, Hyderabad.
4. Rajaraman,V, 2002 Fundamentals of Computer. 3rd ed. Prentice Hall of India, New Delhi.
5. Tanenbrm, A.S. 2006 Computer Networks. 3rd ed. Person Education, New Delhi.

Semester IV

18DPTV0427- OCCUPATIONAL HEALTH AND SAFETY IN DAIRY INDUSTRY

(Credits 2)

Objectives

- To learn safety precautions in handling dairy equipment
- To learn first aid methods and practice it on and off the field

Learning Outcomes

- Students will learn on various hazards that plays major role in dairy industry.
- Students will acquire knowledge on how to handle the various hazards.
- Students get to know about the safety and precautions to be carried in industry.

Unit I : **Safety and Health :** Introduction to Safety Management, Safety Management, Safety Policy under Factories 1948 Act, Dangerous Machineries Act, Safety Committee, Safety Review, Responsibility of Management, Safety Officers Duties & Responsibilities, Safety Targets, objectivess, Standards, Practices and Performances. Motivation & Communication as part of Safety Programme.

Unit II : **Occupational Hazards:** Basics Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards and Thermal Hazards. Occupational health, Occupational hygienic and Occupational Diseases/Disorders prevention.

Unit III : **Accident and Safety:** Need for Personal Protection Equipment, Selection, Use, Care and Maintenance of Respiratory and Non-respiratory Personal Protective Equipment, Non-respiratory Protective Devices of the operator, Accident insurance Schemes.

Unit IV : **First Aid:** Burns, Fractures, Toxic Ingestion, bleeding, wounds and Bandaging, Artificial Respiration, Techniques of Resuscitation.

Unit V : **Safety Health Practices:** Health-Cleanness, Disposal of Waste, Ventilation and Temperatures, Dust and Fumes, Drinking Water, Lighting, Latrines and urinals. Safety – Fencing of machineries, Work on or near machinery in

motion, Hoists and lifts, Pressure plants, Floors, Stairs and means of escape, Protection against fumes and & gases, Safety offers. Welfare – Washing facilities in Dry clothing, Storming, Sitting, First Aid Appliances, Canteen, Shelters for rest and lunch, Creches, Welfare offers, Right and Obligation of workers.

References:

Text books:

1. Ahuja, First Aid, Published by Jaypee Publication – 2nd Edison.
2. Parle & Parle, Preventive and Social Medicine, Published by Benaurus Publication, 23rd Edison.

Semester IV

18ENAV0001 ENERGY AUDITING (Credit 1)

Learning Outcomes

- Students will get to know about the various resources of energy that aid in dairy processing
- This course will provide basic ideas about the Electricity and its transformations.
- Students will learn on concepts related to auditing principles of energy and energy management.

Unit I : **Energy scenario :** Commercial and non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, air pollution, climate change, energy security, energy conservation and its importance, energy strategy for the future, energy conservation act 2001 and its features.

Unit II : **Basics of energy & its various forms:** Electricity basics – DC and AC currents, electricity tariff, load management and maximum demand control, power factor. Thermal basics – fuels, thermal energy content of fuels, temperature and pressure, heat capacity, sensible & latent heat, evaporation, condensation, steam, moist air, humidity and heat transfer, units and conversion.

Unit III : **Energy management and audit:** Definition, energy audit – need, types of energy audit, energy management (audit) approach – understanding energy costs, benchmarking, energy performance

Unit IV : **Energy action planning :** Key elements, force field analysis, energy policy purpose, perspective contents, formulation, ratification, organizing, location of energy management, top management support, managerial function, roles and responsibilities of energy manager, accountability, motivating – motivation of employees, information system designing barriers, strategies, marketing and communicating, training & planning.

Unit V : **Global environmental concerns:** United Nations framework convention on climate change (UNFCC), Kyoto protocol, conference of parties (COP), clean development mechanism (CDM), Prototype carbon fund (PCF), sustainable development.

References:

Text books:

1. Bureau of Energy Efficiency. Guide Book for National Certification Examination for Energy Managers and Energy Auditors
2. PATRICK, Energy Conservation Guidebook, 2nd Edition, The Fairmont Press, Inc., 1993.

Semester IV

18DPTV0428 – INTRODUCTION TO STATISTICS (Credits 2)

Objectives:

- To enable students to be familiar with basic concepts and terms and the uses of statistics in quality control
- To develop skills among the students to carryout analysis using appropriate statistical tools

Learning outcomes:Upon completion of the course,the students will be able to:

- Solve problems using appropriate statistical measures
- Create and interpret visual representation of statistical data.
- Prepare different quality control charts such as $\overline{X}$,$\overline{R}$and σ

Unit I : Introduction to Statistics – Collection, Classification and tabulation of data – Frequency distribution – Graphical and Diagrammatic representation of data – Types and Uses of diagrams and graphs.

Unit II : Descriptive Statistics - Mean, Median and Mode; Range, Standard Deviation, Co-efficient of variation – Simple problems.

Unit III : Population and samples – Selection of sample – Random samples – Standard error – Test of significance - Basic concepts: Types of tests; F-test and Chi-square test of significance.

Unit IV : Correlation and Regression –Concept, Definitions and Sample problems in Correlation and Regression; Uses of Correlation and Regression analysis.

Unit V : Quality control charts – Introduction,processcontrol, control charts, and control limits and specification limits, product control – types of control charts: $\overline{X}$ and$\overline{R}$ chart and other Control chart – Interpretation of control charts – Simple problems.

Reference:

Text books:

1. Angappau, P and R. Gopalakrishnan, Textile Testing, S.S.M Institute of Textile Technology, Komarapalyam, 1997
2. Vijayalakshmi G and Sivapragasam C. Research Methods: Tips and Techniques, MJP Publishers, Chennai, 2009.
3. Gupta, S.P. Statistical Methods. Sultan and Chand Publishers, New Delhi, 1992.
4. Gupta,C.B. An Introduction to Statistical Methods, Vikas Publishers, New Delhi, 1992.
5. Krishnanswamy,O.R, Methodology of Research in Social science, Himalaya Publishing House, Bombay, 2002.

Semester IV

18DPTV0429-DAIRY PLANT DESIGN AND LAYOUT (Credits 3)

Objectives

- To give an opportunity for students to understand about the construction of dairy plant
- To understand about various factor to be considered on constructing the plant

Learning Outcomes

- Students acquire knowledge on arrangements of equipments in dairy plant
- Students get idea about the various factors influence the construction of dairy plant
- It provides knowledge on indoor arrangements of dairy plant.

Unit I : **Introduction:** Type of dairies, perishable nature of milk, reception flexibility. Classification of dairy plants, Location of plant, location problems, selection of site. Dairy building planning, plant site selection basis of dairy layout, importance of planning, principles of dairy layout. Space requirements for dairy plants, estimation of service requirements including peak load consideration.

Unit II : **Designing sections of layouts:** General points of considerations for designing dairy plant, floor plant types of layouts, service accommodation, single or multilevel design. Arrangement of different sections in dairy, sitting the process sections, utility/service sections, offices and workshop.

Unit III : **Planning of layout:** Arrangement of equipment, milk piping, material handling in dairies, Common problems, office layouts- flexibility. Development and presentation of layout, model planning, use of planning table in developing plot plant and detailed layout.

Unit IV : **Construction materials:** Choice of building construction materials, floors, general requirement of dairy floor finishes, floors for different section of dairy. Foundations, walls doors and windows, Drains and drain layout for small and large dairies. Ventilation, fly control, mold prevention, illumination

in dairy plants.

Unit V : **Drawing of layout:** Measurements in drawing, Design and layout of: Milk collection/chilling centre; Fluid milk plant (small, medium and large); Single product dairy (i) Cheese, (ii) ice-cream, (iii) butter and (iv) ghee; Composite dairy plant

References:

Text books:

1. LalatChander, 2009, Dairy plant layout and Design.
2. Sukumar De 1980, Outlines of Dairy Technology. Oxford University Press, New Delhi.

Semester IV

18DPTV0430- DAIRY PLANT MANAGEMENT (Credits 3)

Objectives

- To make up the basic knowledge of management and maintenance of dairy plant and mechanics followed in dairy industry.
- To make up the basic knowledge of layout facilitates in dairy industries.

Learning Outcomes

- Students will learn on managerial strategies in dairy plant.
- Students will get to know about the quality control and quality assurance.
- This course provides knowledge for students on break even analysis, Human resources management and related skills.

Unit I : **Process Strategy and Forecasting:** Process strategy – Operation strategy – Product design – Process selection.

Unit II : **Quality and Performance Management:** Quality – Quality policy – Quality analysis – Quality Assurance – Operation performance – Human Resource Management- Lean Manufacturing – CIP

Unit III : **Decision Analysis and Financial Management:** Approaches to Decision making – Break Even analysis –Methods of Economic analysis**.**

Unit IV : **Store keeping and Inventory Management:** basic concepts of store keeping – Layout of store –Inventory Management – Types – objectives – Classification of inventory.

Unit V : **Production management:** Production planning and Control - forecasting – Aggregate Planning-Work motion and time study- Plant Maintenance- Prevention and Break-down maintenance - Safety hazards -hazards prevention security for plant machinery.

References:

Text books:

1. Ananthakrishnan .C. P and N. N. Sinha (1987), Technology and Engineering of Dairy Plant Management, Lakshmi Publication, Ansari road, Delhi.
2. James. N. Marner (1975), Principles of dairy processing, wiley eastern limited, New Delhi.

3. Pillai. R. S. N and Bagavathi., 2002, Modern Marketing Principles and Practices, S.Chand& Company Ltd., New Delhi.
4. Ramasamy.D, 1999. Dairy Technologists Hand Book International Book Distributing Co, Lucknow.
5. Tuffel Ahmad 1995, Dairy Plant Engineering and Management, KitabMachal Distributers, New Delhi.

Semester IV

18DPTV0431 -DAIRY ENGINEERING III (Credits 3)

(OPERATION AND MAINTENANCE OF DAIRY MACHINERIES)

Objectives

- To provide engineering knowledge on constructions and operations related to milk processing machineries.
- To provide knowledge on heat transfer mechanisms and working principles of dairy industry machineries.

Learning Outcomes

- This course provides knowledge on working principles of various dairy processing equipments including pasteurizer, homogenizer, heat exchangers, condensing equipments.
- Students will get knowledge on handling of equipments related to dairy process.

Unit I : **Milk reception-** Milk received through cans, tanks – methods employed for measuring milk; construction and component details of milk transport tanks. Storage tanks: silo tanks, refrigerated storage tank, process tank, aseptic tank and bulk milk cooler. Can washer: working principle and their maintenance.

Unit II : **Heat transfer –** Mechanisms of heat transfer – Heat exchanger – Effectiveness of heat exchanger, Exchange efficiency; Tubular heat exchangers – shell and tube and concentric tubes; plate heat exchanger – merits and specifications; comparison of direct and indirect heating system.

Unit III : **Pasteurizer:** constructional features, operation and maintenance of batch and HTST pasteurizers and controls, components involved, advantages and disadvantages; Sterilizer: equipment used for milk sterilization and UHT processing.

Unit IV : **Cream separators:** Principles of centrifugal separation, self desludging clarifiers. Efficiency, capacity and maintenance of separator. Homogenizers: constructional features, operation and maintenance of homogenizer and accessories.

Unit V : **Condensing and drying equipments:** Multiple effect evaporator and accessories. Equipments for drying of milk: roller drier, spray drier and their accessories. Filling machines: milk sachet and aseptic filling machines and their maintenance.

References:

Text books:

1. GostaBylund (1995), Dairy processing hand book, Tetra pak processing systems AB, Swedwn
2. James. N. Marner (1975), Principles of dairy processing, wiley eastern limited, New Delhi.
3. Ramasamy D, 1999. Dairy Technologists Hand Book, International Book Distributing Co, Lucknow
4. Sukumar De 1980, Outlines of Dairy Technology. Oxford University Press, New Delhi.
5. Tuffel Ahmad 1995, Dairy Plant Engineering and Management, KitabMachal Distributers, New Delhi

Semester IV

18DPTV0432- FOOD SAFETY AND QUALITY STANDARDS (Credits 3)

Objectives

- To provide an opportunity to learn food safety and quality in relation to dairy industry
- To gain knowledge about the national and international quality standards.

Learning outcome

- Student will understand about various safety management systems to be followed and their application in dairy industry.
- This course will provide the students regarding various organizations/agencies that impose food safety regulations.

Unit I : **Food safety:** definition – responsibilities- traditional problems – emerging pathogens. Introduction to Risk Analysis, Risk Management, Risk Assessment, Risk Communication.

Unit II : **Quality Management system –** definition – terminology - Principles of quality management systems – benefits of quality management systems.

Unit III : **Food laws:** definition of food standards – food legislation – general food laws – main objectives of food law – general principles of food law- main features and functions. Integrated food law.

Unit IV : **Regulatory systems/agencies- I:** Role of national organizations such as FSSAI, BIS, FAO and AGMARK. Significance of CODEX and APEDA in dairy industry.

Unit V : **Regulatory systems/agencies- II:** Role of International organizations such as ISO 9000-2000, HACCP, TQM and GMP in dairy industry.

References:

Text books:

1. Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee 2002,Technology of Indian Milk and Milk Products, Dairy India Publication
2. Gould, W.A. and Gould, R.W. 1988. Total Quality Assurance afor the Food Industries, CTI Publications Inc, Baltimore

3. Ramakant Sharma 2006, Production, processing and quality of milk products International book distributing Co, Lacknow.
4. SandeepTomar. 2013, Dairy products research and analysis, Oxford book company, Jaipur.
5. Srilakshmi, B. 2005. Food Science, New Age International (P) Ltd., Publishers, New Delhi.

Semester IV

18DPTV0433 -PRACTICAL VII (Credits 3)

(PLANT MANAGEMENT)

Learning Outcomes

- Students will get practice on designing layout for construction of new dairy plant installation.
- This course will provide practical knowledge to students on operating various equipments.
- It provides practical knowledge on various quality management systems.

1. Designing a layout for pasteurized and homogenized milk processing unit
2. Designing a layout for dairy product preparation unit.
3. Designing a layout for condensed and spray drying unit.
4. Study on various machineries used in milk processing unit
    - Pasteurizer
    - Homogenizer
    - Packaging machines
    - Cream separator and clarifier
    - Butter churner
5. Setting up laboratories to support TQM system
6. Assessment of hygiene of personnel working in the plant
7. Assessment of packing materials for hygiene
8. Design a HACCP tree for milk shed area
9. Design a HACCP tree for milk processing industries
10. Visit to Tamilnadu Food Safety and Drug Administration Department

Semester IV

18DPTV0434 -IN-PLANT TRAINING (Credits 6)

(QUALITY CONTROL)

Objective

- Students have to undergo In-plant training at an established dairy unit and should learn about all the following procedure.

Work Plan

1. Learn the application of computers in dairy plant.
2. Check for the safety aspects followed in dairy plant
    a) Machineries
    b) Various sources of hazards.
    c) Safety protection for employees.
    d) Check for physical safety in dairy unit.
3. Practice on internal and external audit conducted at dairy unit.
4. Plant Layout
    a) Design the layout of dairy plant layout
    b) Study the structure of layout and suggest improvements.
    c) Study on flooring, walls, ventilation, lighting and equipments
5. Study the constructional features, maintenance and operation of:
    a) Mechanical can washer
    b) Silo tank and Milk transport tank
    c) Bulk milk cooler
    d) Batch pasteurizer
    e) HTST pasteurizer
    f) Cream separator
    g) Homogenizer
    h) Sachet filling machine
    i) Roller drier
    j) Spray drier
6. Quality control
    a) Analysis for risks and management of risks

b) Find the various sources of contamination

1. At reception section
2. At processing section
3. At product manufacture section
4. At product storage section and silos
5. At packaging section

c) Study on plant environmental sources of contamination.

d) Check for the application of Food laws and Regulatory systems.

1. FSSAI
2. CODEX
3. MMPO
4. APEDA
5. BIS
6. HACCP
7. TQM and GMP

Assessment

Students who underwent the In-plant training should submit a report based on the daily routine activities that performed by them in the dairy processing and quality control unit. Also, they should submit report on the daily activities that they carried out with the details of date and timing. After the successful completion of In-plant training an examination along with a viva voce will be conducted and evaluated.

SEMESTER - V

Semester V

18DPTV0535- DAIRY ECONOMICS AND MARKETING (Credits 3)

Objectives

- To provide the knowledge about economic relevant to dairy sector.
- To workout the cost of economics in an area related to dairy farm, small scale dairy units and industry.

Learning Outcomes

- Students will understand how an economic balance to be maintained in dairy sector
- Students will gain knowledge on various aspects of marketing of dairy products
- Students will understand about market and marketing theories.

Unit I : **Economics of Different sizes of Dairy units:** Requisites of economic return from Dairy Farm – Economic traits – Farm size, location and farm soil conditions, climate of the area – Number of cows and fodder – Milk production capacity of individual cows. The cost and return of ten cow and ten buffalo dairy unit and two cow and two buffalo dairy unit – Initial investment, cost of animals, buildings, equipments - a). fixed cost - depreciation, b). Building equipments, insurance, c). Recurring cost – first year concentrate, green fodder, dry fodder, medicines, forage cost, labour. d). Returns – milk cost, manure cost and others) Total income, cost of production per cow.

Unit II : **Economics of Milk Products:** Cost benefit analysis of indigenous products – Khoa, Paneer, Dahi, Shrikhand – Fat rich products – Butter, Cream, Ghee, Dried products – Condensed milk, Milk Powder – Frozen products – Ice cream , Kulfi – Value Added Products – Flavoured milk, whey beverages.

Unit III : **Market and classification:** Definition of market – concepts in marketing and management – Marketing : marketing area – classification of markets – approaches to marketing problems – marketing costs and margin – planning , organization – motivation and controlling.

Unit IV : **Marketing Management Functions**: Product planning – Sales organizations,

market research, physical distribution – Services of different market functionaries – Advertisings.

Unit V : **Product and its sales:** Sales forecast - uses – methods of sales forecast – limitations – services of wholesales and remedies – marketable surplus – importance of marketable surplus and factors responsible for low marketable surplus.

References:

Text books:

1. A.S.Kahlon, Karam Singh, 1981. Economics of Farm Business Management in India, Allied Publishers Private Limited.
2. C.P.Annathakrishnan and B.N.Padmanabhan, 1989-Dairy farming and Milk Production. Madras: Shri Lakshmi Publications,
3. Dr. C.B.Mamoria and Dr. BadriBishalTirupati, 2003. Agricultural Problems in India. KitabMahal publisher.
4. R.S.N.PillaiBagavathi, 2002, Modern Marketing Principles and Practices, S.Chand& Company Ltd. New Delhi
5. S.S.Johl and T.R.Happer, 1973. Fundamentals of Farm Business Management. Kalyani Publishers.

Semester V

18DPTV0536- ADULTERANTSAND CONTAMINANTS IN MILK AND MILK PRODUCTS (Credits 4)

Objectives

- To understand the fundamentals of food quality and control procedures.
- To provide hands on training about adulteration and detection methods.

Learning Outcomes

- This course provides knowledge on various adulterants that added to milk and milk products.
- It provides knowledge to students on various tests to detect adulterants.

Unit I : **Adulteration and contaminants:** Definition, classification of adulterants, List of foods commonly adulterated, harmful effects of adulterants and contaminants. Food laws – adulteration acts.

Unit II : **Quality testing of market milk:** use of bio protective factors for preservation of raw milk: effects on physiochemical, microbial and nutritional properties of organic milk. Status of preservation of raw milk.

Unit III : **Adulteration of carbohydrates in milk:** starch, sugar, glucose and Dextrin/Maltodextrin – detecting methods - health effects. Adulteration of Fertilizers and salts in milk: urea, pond water, ammonium compound and common salt – detecting methods - health effects. Detergents in milk.

Unit IV : **Adulteration of neutralizer and preservative in milk**: sodium hydroxide, sodium carbonate - sodium bicarbonate - formaldehyde - hydrogen peroxide – MRL- Detecting methods - health effects. Permitted preservatives and its limits.

Unit V : **Adulteration of milk Products:**Vanaspati – animal body fats – vegetable oils in fat rich products– detecting methods - health effects. Effects and health impacts of artificial/synthetic colour and flavours in milk and milk products.

References:

Text books:

1. Early, R. (1995). Guide to Quality Management Systems for the Food Industry, Blackie, Academic and Professional, London
2. Farrington and Woll. 2010. Testing milk and its products, Axis Books Publ, Jodhpur.
3. Gould, W.A. and Gould, R.W. 1988. Total Quality Assurance for the Food Industries, CTI Publications Inc, Baltimore
4. Ramakant Sharma 2006, Production, processing and quality of milk products International book distributing Co, Lucknow.
5. SandeepTomar. 2013, Dairy products research and analysis, Oxford book company, Jaipur.
6. Srilakshmi, B. 2005. Food Science, New Age International (P) Ltd., Publishers, New Delhi.

Semester V

18DPTV0537 - DAIRY FOOD INGREDIENTS AND ADDITIVES (Credits 3)

Objectives

- To provide in-depth knowledge, facts and principles of dairy ingredients.
- To impart basic knowledge regarding food dispersion systems, their formation, behavior, and factors affecting their stability.

Learning Outcomes

- Students will acquire knowledge on various ingredients and its application in dairy industry.
- Students get to know about the role of each ingredient and its effect over the milk product sensorialy.

Unit I : **Food groups:** Proximate composition, food composition tables – uses. Threshold values. Definition of texture, rheology and psychophysics of foods. Milk foams and their applications, egg foams and uses, foam formation. Theory of gel formation; pectic substances and jellies; fruit pectin gels; milk jellies. Structure of dairy foods representing emulsions, foams and gels.

Unit II : **Dairy ingredients:** Significant features – applications in food industry - potential for use in improving health - future prospects. Fortification and value addition of dairy ingredients and food additives.

Unit III : **Natural phyto-compounds:** Naturally occurring colours, acids, flavour and aroma components present in herbs, spices, coffee, tea, cocoa, fruits and vegetables. New food ingredients: need for new ingredients, sweeteners, sugar replacer and fat replacer.

Unit IV : **Nutraceuticals:** definition – classification – role in promoting human health of amino acids, fatty acids, LDL, HDL, cholesterol, CLA, phytonutrients, micro minerals and vitamins.

Unit V : **Dietary and therapeutic significance of bioactive components in dairy**: Casein, lactose, whey proteins, immunoglobulin, lactoferrin, milk minerals, prebiotics, probiotics and synbiotics. Physio-chemical properties and role of milk constituents.

References:

Text books:

1. Eeckless C.H, W.B Combs and H.Mecy (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd. New Delhi.
2. Mudambi SR &Rajagopla MV. 1981. Fundamentals of Foods and Nutrition.
3. Pomeranz Y. 1991. Functional Properties of Food Components. Academic Press.
4. Sadler MJ &Saltmarch M. 1998. Functional Foods: The Consumer, The Products and the Evidence. Royal Society of London.
5. Sukumar De (1980) Outlines of Dairy Technology, Oxford University Press, New Delhi.
6. Walstra P &Jenness R. 1984. *Dairy Chemistry and Physics*. John Wiley & Sons.

Semester V

18DPTV0538DAIRY PLANT – CASE STUDY (Credits 2)

Objectives

- To understand the ways and means of establishment of mini dairy unit

Learning Outcomes

- Students will get clear idea on how a processing plant works.
- It makes students to find frame budget for establishment of industry
- Students will learn about the various strategies facing by industries

Work Plan

The student shall be placed in dairy unit and assess the possibilities of establishing mini dairy units on their own. He/She shall be asked to prepare a budget plan for the establishment of dairy plant. Each student is expected to do an individual case study. The evaluation will be based on the case study report and viva voce examination.

Semester V

18DPTV0539 - DAIRY TECHNOLOGY – II (Credits 3)

(FAT AND PROTEIN RICH DAIRY PRODUCTS)

Objectives

- To impart knowledge regarding fat and protein rich milk products.
- To gain hands on training on production on fat and protein rich milk products.

Learning Outcomes

- Students will learn on methods of cream production, butter production and ghee manufacture.
- Students get to know about preparation of protein rich dairy products and their importance.
- Students will gain knowledge on storage, merits and demerits of fat and protein rich products.

Unit I : **Cream:** definition – chemical composition - types of cream – production technique- physiochemical properties – effect of fat percentage of cream on its specific gravity – defects and control measures. Neutralization of cream.

Unit II : **Butter:** history - definition - standards – physicochemical characteristics – classification of butter - method of manufacture – theory of churning - over run – defects and control measures.Continuous butter making. Margarine: characteristics and types of margarine.

Unit III : **Butteroil and Ghee:** definition – standards - method of manufacture – organoleptic and physiochemical properties – defects and control measures. Difference of ghee and butteroil. Importance of ghee in India. Ghee residue:definition – composition – utilization of ghee residue – nutritional benefits.

Unit IV : **Cheese:** definition – standards - origin and history of cheese – milk clotting enzymes from different sources (animal and plant) -rennet – factors affecting rennin action – coagulation - method of manufacture of cheese - defects and control measures.

Unit V : **Cheese varieties:** definition, composition, standards, production techniques and defects and control measures of cheddar cheese - cottage cheese - mozzarella cheese - processed cheese - cheese spread - pizza.

References:

Text books:

1. Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee (2002)., Technology of Indian Milk Products, Dairy India year book 2007.
2. Eeckless C.H, W.B Combs and H.Mecy (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co. Pvt.Ltd. New Delhi.
3. Mathur MP, Roy DD &Dinakar P.1999. *Textbook of Dairy Chemistry*. ICAR.
4. Ramasamy, D (1999) Dairy Technologist's Hand Book, International Book distributing Co, Lucknow.
5. Sukumar De (1980) Outlines of Dairy Technology, Oxford University Press, New Delhi.

Semester V

18DPTV0540- DAIRY TECHNOLOGY – III (Credits 3)

(TRADITIONAL AND VALUE ADDED DAIRY PRODUCTS)

Objectives

- To project the significance and status of traditional dairy products in Indian dairy industry.
- To gain an understanding of manufacturing methods of traditional dairy products

Learning Outcomes

- Students will acquire knowledge on various traditional dairy products and their methodology of preparation.
- It makes the students to prepare the tradition products on their own.
- Students will get understand about value addition and their application in dairy industry.

Unit I : **Indigenous dairy products:** definition – present status and market potential of traditional dairy products – globalization of traditional dairy products – classification of traditional milk products.

Unit II : **Heat desiccated milk products –**Khoa – Classification- methods of manufacture – Factors affecting yield of khoa –yield and cost analysis of khoa. Confections made from khoa –burfi, peda, milkcake, kalakand, gulabjamun, rabri, malai, khurchan, basundhi – composition – manufacturing practices – Nutritive value

Unit III : **Heat acid coagulated products:** Chhana- definition- composition- methods of manufacture, Chhana based sweets – sensory evaluation- packaging and preservation methods- yield and cost analysis.Paneer: definition- mechanization of paneer manufacturing - paneer based products – storage and packaging and preservation methods – Nutritive value of paneer.

Unit IV : **Channa based products:** Chhana – Product description, methods of manufacture, packaging and preservation. Chhana based sweets – Rasogolla, Sandesh, Rasmalai, and Chhanapodo - their manufacturing practices,

compositional profile and mechanization of manufacturing process including packaging

Unit V : **Milk based pudding desserts:**Kheer and Payasam – Product description, methods of manufacture- sensory evaluation- value added dairy products – definition –types – method of manufacture – packaging processes (canning) – interaction between milk and cereal constituents- yield and cost benefit analysis.

References:

Text books:

1. Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee 2002,Technology of Indian Milk and Milk Products, Dairy India Publication
2. Dairy India year book 2007 & 2017, A- 25 Priyadarshinivihar, Delhi 110092, India.
3. David.J, 2009 "Technologies advanced in indigenous milk products" published by KitabMahal, 22-A, Sarojini Naidu Marg, Allahabad (2nded).
4. Eeckless C.H, W.B Combs and H.Mecy (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd. New Delhi.
5. Sukumar De (1980), Outlines of Dairy Technology, Oxford University Press, New Delhi.

Semester V

18DPTV0541- PACKAGING AND JUDGING OF MILK PRODUCTS (Credits 3)

Objectives

- To impart advanced knowledge about dairy product packaging to extend the shelf life of product by favorable appropriate packaging material and advanced techniques.
- To impart knowledge about the judging and grading of dairy product in the industrial level.

Learning Outcomes

- This course provides knowledge on packaging materials used in dairy industry.
- Students will learn about the various properties of packaging materials and their effects over the packed food.
- Students will get idea regarding the threshold value, sensory evaluation and its methodologies in dairy products.

Unit I : **Packaging materials** - types of packaging materials – aluminium foils/containers, glass, LDPE, HDPE, PET, polystyrene, polypropylene, PVC, Multi-layer sheet/film and BOPP - range of packing materials - disposal packaging materials – dump filling - incineration – reuse – recycling packaging materials.

Unit II : **Packaging**- packaging – function – use of different material in milk and milk products-packaging of heat and acid coagulated products- packaging of cultured/fermented milk – packaging of milk based pudding/desserts. Eco-friendly- edible packaging – biodegradable packaging.

Unit III : **Packaging techniques**– Packaging technique like vacuum packaging, modified atmospheric packaging (MAP) ,oxygen absorbers/scavengers, poly clip system, aseptic packaging. Compatibility and toxicity of packaging materials.

Unit IV : **Fundamental rules for scoring and grading of milk and milk products**– Types of tests. Panel selection, screening and training judges, requirement of sensory evaluation, sampling procedures and sensory characteristic of food.

Unit V : **Judging and grading –** defects in milk, score card and its uses – judging and grading of milk- judging and grading of fat rich products - judging and grading of frozen dairy products - judging and grading of concentrated milk products - Judging and grading of dried milk products - judging and grading of fermented milk products- judging and grading of indigenous milk sweets.

References:

Text books:

1. Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee 2002,Technology of Indian Milk and Milk Products, Dairy India Publication.
2. Dairy India year book 2007 & 2017, A- 25 Priyadarshinivihar, Delhi 110092, India.
3. Eeckless, C.H., Combs,W.B. and Macy, H., 1955, Milk and Milk Products, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. SubhasishBiswas, Subhash Kumar Battacharyya, 2006, Milk and milk products technology, Jaypee Brothers medical publishers (P) Ltd, New Delhi.
5. Sukumar, De., 1980, Outlines of Dairy Technology, Oxford University Press, New Delhi.

Semester V

18DPTV0542 -PRACTICAL VIII (Credits 3)

(PRODUCT DEVELOPMENT – I)

1. Preparation of cream
2. Estimation of chemical composition of cream
3. Preparation of butter
4. Preparation of butteroil and ghee
5. Estimation of chemical composition of butteroil and ghee
6. Preparation of khoa and Peda
7. Preparation of Burfi
8. Preparation of Gulabjamun
9. Preparation of Channa based products: Paneer and Rasogolla
10. Sensory evaluation, Judging and packaging of following products;
    a. Milk.
    b. Cream
    c. Butter
    d. Ghee
    e. Condensed and evaporated milk
    f. Cheese and related products
    g. Frozen products
    h. Khoa and khoa based sweets
    i. Fermented dairy products
11. Detection of sugar, starch and glucose in milk
12. Detection of neutralizer in milk by Rosalic acid test and Alkalinity of ash test
13. Detection of formaldehyde in milk by Hehner / Chromotropic acid/ Leech Test
14. Detection of Ammonium Sulphate in milk
15. Detection of Vanaspati in Ghee
16. Test for Skimmed Milk Powder in Natural Milk

Semester V

18DPTV0543- EXPERIENTIAL LEARNING II (PRODUCT MANUFACTURING)

(Credits 6)

Objective

- Students have to undergo experiential training at university dairy technology on dairy products.
- Students have to prepare dairy products on their own and should market the product among the public and collect the suggestion for the product improvements.

Work Plan:

1. Product preparation.

A) Fat rich dairy products

- Cream
- Butter
- Ghee

B) Traditional dairy products

- Khoa,
- Peda,
- Burfi,

C) Protein rich products

- Paneer,
- Channaandchanna based products
- Cheese
- Casein and caseinate.

D) Packaging

- Learn various methods of packing of dairy products
- Learn the operation of packaging machine

E) Lactose

- Preparation of Lactose
- Preparation of Lactose based products

F) Observe various marketing strategies of dairy products.

G) Prepare various dairy products and put on the market.

Assessment

Students who underwent the inplant training should submit a report based on the daily routine activities that performed by them in the dairy processing and quality control unit. After experiential learning, students should submit their business analysis report with a presentation. The evaluation will be based on following criteria.

Evaluation of Experiential Learning Programme

S.No.	**Parameters**	**Max. Marks**
1.	Project Planning and Writing	10
2.	Presentation	10
3.	Regularity	10
4.	Monthly Assessment	10
5.	Output delivery	10
6.	Technical Skill Development	10
7.	Entrepreneurship Skills	10
8.	Business networking skills	10
9.	Report Writing Skills	10
10.	Final Presentation	10
	Total	**100**

SEMESTER - VI

Semester VI

18DPTV0644 - ENTREPRENEURIAL SKILLS AND BUSINESS TRADE (Credits 3)

Objectives

- To expose the students about the scope for identifying and establishing enterprise in their locality.

Learning Outcomes

- Students will learn about the need and opportunities in the field of dairy.
- This course provides idea on starting of cottage and small scale industries.
- Students will show their enthusiasm in startup of industries and develop their Entrepreneurship skill with various training.
- This course also provides information on various regulatory laws involved in food processing.

Unit I : **Introduction to Entrepreneurship;** Definition – concept – industrial small entrepreneurship- meaning-important-signification and scope- characteristics of entrepreneur-Factors influence rural entrepreneurial development

Unit II : **Industries for small Entrepreneurs:** General study of cottage and small scale industries- Enterprise Management – Need and important- Women Entrepreneurship development through SHG – Entrepreneurial competencies.

Unit III : **Registration & Financing:** Identification of opportunities - choice of product - preparation of feasibility - Report- Registration and License - Financial assistance Nationalized banks - State financial corporation - DIC – KVIB – KVIC – NSIC, SIDBI, NABARD, SMAM and NHB – Incentives and Government support from Ministry of Agriculture, GOI.

Unit IV : **Entrepreneurial Development:** Approaches to Entrepreneurship Development – EDP – Issues – Entrepreneurial Training – Methods and Institutions offers Entrepreneurial Training – Market Survey – Model Project Report.

Unit V : **Regulatory Laws:** Central Excise – Income Tax – Sales Tax – Licensing Authority – Export and Import Regulatory Acts.

References:

Text books:

1. Empowerment of Women through Entrepreneurship, 2008, RathakrishnanL,Gyan Publishing House, New Delhi. 464.
2. Entrepreneurial Development, 2005, Khanka, S.S., published by S.Chand&Co.publications,New Delhi.
3. Entrepreneurship and Small Business Management, 2003, Shukla, Published by KitabMahal publications, Agra.
4. Small – scale industry and Entrepreneurship, 2003, Vasanth Desai, Himalaya Publishing House, Mumbai.
5. Training for entrepreneurship and Self Employment, 1999, Malli, D.D, published by Mittal publications, New Delhi.
6. Women Entrepreneurship: Opportunities, Performance, Problems, 2002, Dhumija, S.K.,published by Deep and Deep publications, New Delhi.

Semester VI

18DPTV0645- DAIRY EXTENSION EDUCATION (Credits 3)

Objectives

- To teach the students about the basics of extension education and to impart skill in the handling of various extension methods and audio-visual aids
- To expose the students to various dairy development programmes and institutions and their importance to rural development

Learning Outcomes

- Students will learn on various extension activities.
- Students will get knowledge on development activities for rural development, cattle breeding, etc.
- Students will gain practice on handling of various audio-visual aids.

Unit I : **Education-**types. Differences between formal and extension education. Extension Education – Meaning, Scope, Principles, Philosophy and objectives. Qualities of Extension workers. Diffusion and Adoption of innovations- Attributes of Innovation. Adoption process and ID Process. Adopter categories and their characteristics. Consequences of adoption of innovation.

Unit II : **Extension methods**- meaning, purpose and classification. Farm and Home visit, office call, telephone call, personal letter, result demonstration and Agri-clinics. Method demonstration, General meetings, group discussion, brainstorming, seminar, workshop and field trips. Farm journalism- scope and functions. Publications- leaflet and folder, extension journals, newspaper, extension bulletins, newsletter and circular letter. Radio, television, exhibition, campaign, farmers' fairs, film shows.

Unit III : **Audio-Visual Aids:** Audio-recording- types of recording- tape recorder, CDs, DVDs, mp3 players and public address system. Visual- Literature, symbolized- charts and graphs. Three dimensional- models, specimens and objects. Two-dimensional-non-projected- photographs, still pictures, chalk

board, bulletin board. Projected- slides, MS power point presentations, LCD. Audio-visual- television, film shows, video projections, e-lessons. Mobile probaganda –application development – digitalization.

Unit IV : **Socio-economic status and causes** for poor conditions in villages and differences between rural and urban societies. Rural Development- concept, objectives and its role in Indian economy. Importance and scope of Dairying in the economic development of rural India. Birth and development of A.H. department- administration and services. Cattle Breeding and Fodder Development programme, Intensive Dairy Development Programme and Dairy Cooperative movement. Operation Flood Phase I, II & III-National Milk Grid, Technology Mission on Dairy Development.

Unit V : **Establishment and activities** of Indian Dairy cooperation NDRI, IVRI, IRMA, AMUL, NCDFI and TANUVAS. Emergence of private sector dairies- organization and significance. Self Help Groups- group formation, functioning, role of NGOs in linking SHGs to formal credit system and development of SHGs, credit linkage models.

References:

Text books:

1. Annamalai, R. 1993. Extension Education and Programme Planning. Palaniappa Printers, Tirunelveli.
2. Dahama, O.P and O.P.Bhatnagar. 1996. Education and Communication for Development, Oxford & IBH Publishing Co., Ltd., New Delhi.
3. Rogers, G.M., and F.F. Shoemaker. 1971. Communication of Innovations- A Cross cultural approach.
4. Seetharaman, Netaji. R., et.al. 1990. A Manual on Audio-visual Aids.
5. Sundaramari, M. 2006. Agriculture and Dairying- A Rural Development Perspective, NCBH, Chennai.

Semester VI

18DPTV0646 - BY PRODUCTS UTILIZATION (Credits 3)

Objectives

- To provide the knowledge about by products from animal and milk
- To gain hands on training to utilization of dairy by products.

Learning Outcomes

- Students get to know about the various byproducts that expelled as waste in dairy industries and their economical values.
- Students will learn the process of conversion of byproducts and utilizing it.
- Student will attain through knowledge about whey,butter milk and lactose.

Unit I : **By-products** – definition, classification, status, availability and utilization of food by products in India and Abroad.-Benefits of by-product.

Unit II : **Milk By Product – I:** Casein – definition - types – specifications – co precipitates - principles - manufacturing processes - physicochemical and functional properties and food applications - Industrial and edible uses of caseins- Nutritional importance.

Unit III : **Milk By Product – II:** Whey - composition - types – specification - manufacturing techniques - Fermented products from whey - Beverages from whey - Condensed whey – WPC- Nutritional importance.

Unit IV : **Milk By Product – III:** Lactose – definition – types - methods for the industrial production of lactose - refining of lactose - uses of lactose and hydrolysis of lactose - Nutritional importance.

Unit V : **Milk By Product – IV:** Buttermilk processing - Condensed butter milk - Dried butter milk - Utilization of buttermilk products- Nutritional importance. Ghee residue- Composition- processing and utilization- Nutritional importance. Membrane technology for effective utilization of dairy by products.

References:

Text books:

1. Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee (2002)., Technology of Indian Milk Products, Dairy India year book 2007.
2. Eeckless C.H, W.B Combs and H.Mecy (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd. New Delhi.
3. Mathur MP, Roy DD &Dinakar P.1999. *Textbook of Dairy Chemistry*. ICAR.
4. Ramasamy, D (1999) Dairy Technologist's Hand Book, International Book distributing Co, Lucknow.
5. Sukumar De (1980) Outlines of Dairy Technology, Oxford University Press, New Delhi.

Semester VI

18DPTV0647- WASTE DISPOSAL AND EFFLUENT TREATMENT (Credits 3)

Objectives

- To disseminate the knowledge pertaining to waste water treatment in dairy food processing plants.
- To understand environmental issues and remedial measures in dairy industrial sector and to develop the skill for friendly environment management in the industrial sector.

Learning Outcome

- This course provides knowledge about the importance of environment and ways to protect the environment.
- Students will know about the quality of water supplied to farm and dairy plant.
- Students will understand about dairy waste produced in plant and their treatment and disposal process.

Unit I : Environmental hygiene- introduction – air quality control in dairy processing areas- air filtration for indoor air qualities – HNAC (Heating, Ventilating and air condition) - out door environment clean room operation. Environment protection acts: Issues concerning release ofgenetically engineered microorganisms in environment; environmental laws.

Unit II : Water- Quality of farm and plant water supplied – Routine and special methods for water analysis, purification of water – Requirement of water for farm and plant.

Unit III : General Characteristics of dairy waste – introduction- source of dairy waste- objectives of treating dairy waste – composition of dairy waste. Sewage: types, flora of sewage. Brisket – Panchakaviya

Unit IV : Treatment and disposal of dairy waste water: Disposal methods – Sources of effluents and their recycling in dairy industry – Biogas formation–Aerobic treatment of dairy waste water – anaerobic digestion – measurement- treated dairy effluents and its disposal. Zero discharge

Unit V : Determination of BOD – COD – Waste water discharge standards – Mode of entry and occurrence of antibiotics, pesticide residues and heavy metals in milk and milk products and their preventive measures.

References:

Text books:

1. Anantha Krishnan, C.P., (1991), Technology of milk processing, Sri Lakshmi Publications, Chennai -10.
2. Ramasamy,1999, Dairy Technologists Hand Book, International Book distributing Co., Lucknow.
3. SubhasishBiswas, Subhash Kumar Battacharyya, 2006, Milk and milk products technology, Jaypee Brothers medical publishers (P) Ltd, New Delhi .
4. Sukumar De (1980), Outlines of Dairy Technology, Oxford University Press, New Delhi
5. Yadav, J.S Sunita Grover and V.K. Batish (1993), A Comprehensive Dairy Microbiology, Metropolitan Book Co. Pvt. Ltd., New Delhi.

Semester VI

18DPTV0648-DAIRY TECHNOLOGY – IV (Credits 3)

(CULTURED, FROZEN AND DRIED MILK PRODUCTS)

Objectives

- To impart knowledge regarding frozen, fermented, concentrated and dried milk products.
- To gain hands on training on production on frozen, fermented, concentrated and dried milk products.

Learning Outcomes

- Students will gain knowledge on various process flows for preparation of variety of frozen, fermented and condensed dairy products.
- This course provide knowledge on physiochemical properties of products including ice-cream, dairy powders and fermented dairy products
- Students will get to know about the technical problems involved in production of dairy products.

Unit I : **Fermented milk products**: Definition, specifications, physiochemical properties and method of manufacture of Dahi, yoghurt, acidophilus milk, Kefir, Kumiss, Bulgarian butter milk -mistidoi **–** lassi- sensory evaluation.Chakka: – Product description – method of manufacture – Shrikhand –Product description – method of manufacture- sensory evaluation.

Unit II : **Ice cream and Kulfi** – definition- specifications – role of the constituents in ice cream - properties of ice cream mix – action of stabilizers and emulsifiers in ice cream - production techniques of ice cream – defects and control measures. .

Unit III : **Condensed milk and evaporated milk:** Definition - composition - standards – types of condensed milk - method of manufacture – pilot sterilization test - defects and control measures.

Unit IV : **Whole milk and skimmed milk powder:** definition – standards - types – mechanism of spray drying and roller drying – production technique - instantization- keeping quality of milk powder - defects and control measures.

Unit V : **Dried Powder production –**Composition and method of production of cream powder – butter power – infant milk powder- malt milk powder – ice cream mix powder – cheese powder – shrikhand powder – khoaandgulabjamun powder.

References:

Text books:

1. Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee (2002)., Technology of Indian Milk Products, Dairy India year book 2007.
2. Eeckless C.H, W.B Combs and H.Mecy (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd. New Delhi.
3. Fox, P.F. and P.L.H. McSweeney. Advanced Dairy Chemistry. 3rd ed. Vol. 1. Proteins (2003). Vol. 2. Lipids (2006). Vol. 3. Lactose, Water, Salts and Minor Constituents (2009). Springer
4. Mathur MP, Roy DD &Dinakar P.1999. *Textbook of Dairy Chemistry*. ICAR.
5. Ramasamy, D (1999) Dairy Technologist's Hand Book, International Book distributing Co, Lucknow.
6. Robinson, R. K., ed. 1994. Modern Dairy Technology. Vol. 1. Advances in Milk Products. Vol. 2. Advances in Milk Processing . Elsevier, NY.
7. Sukumar De (1980) Outlines of Dairy Technology, Oxford University Press, New Delhi.

Semester VI

18DPTV0649-DAIRY NOVELTIES AND MODELING (Credits 2)

Objectives

- To gain knowledge on the latest concept in area related to dairy production and technology.

Learning Outcome

- Students will get practical knowledge on development of new dairy products and value addition for dairy products.
- Students will know about the technical and non technical issues involved in development of new products.

Work Plan

The student should develop new/improved products or create latest data base or analytical procedures or low cost methods or waste utilization and value addition methods in the area related to dairy production and technology. At the completion of the project the student will submit a project report. The evaluation will be based on the project report and a viva voce examination on the project.

Semester VI

18DPTV0650- PRACTICAL IX (Credits3)

(PRODUCT DEVELOPMENT – II)

1. Preparation of ice cream
    a. Softy icecream
    b. Honey ice cream
    c. Ginger icecream
    d. Chocolate icecream
    e. Fruit based icecream
2. Estimation of chemical composition of ice cream
3. Preparation of dahi
4. Preparation of yoghurt
5. Estimation of chemical composition of dahi and yogurt.
6. Preparation of acidophilus milk.
7. Preparation of Kumis.
8. Preparation of lassi.
9. Preparation of Fermented products from whey
10. Preparation of Beverages from whey.
11. Preparation of basundhi
12. Preparation of flavoured butter milk
13. Preparation of probiotic dairy product

Semester VI

18DPTV0651 - INPLANT TRAINING – OVERALL DAIRY INDUSTRY (Credits10)

Objective

- Students have to undergo Inplant training at an established dairy unit and should learn about all the following procedure.

Work Plan

1. Reception
    a. Record milk inlet
        i. Record the details of milk route and cans.
        ii. Weighing and fat percentage of inlet milk.
    b. Laboratory
        i. confirm the quality of received milk
        ii. analysis of proximate composition
    c. cleaning and sanitation
        i. Preparation of cleaning solution.
        ii. Proper usage of cleaning and sanitizing solution.
2. Documentation
    a. Record all the reading at various dairy sections
        i. Reception section
        ii. Processing section
        iii. Packaging section
        iv. Waste management section
        v. Transportation and storage.
        vi. Product preparation
        vii. Ingredient section - Prepare balance sheet and maintain the record.
    b. Document all the recorded values and management of records.
3. Product section
    a. Work at various product sections and document the process.
        a) Condensed and Evaporated milk section
        b) Frozen product section.
        c) Fermented product section

d) Preparation of Condensed whey
e) Dried powder

b. Standardize the process.
c. Check for quality and proximate analysis of all products produced
d. Document the quantity and quality of produced products.

4. Planning and execution
    a. Make work plan for employees.
    b. Assign the works for workers and confirm their working schedule.
    c. Plan on production process
5. Waste management
    a. Analysis the amount of waste produced in plant.
    b. Prepare procedure for management of waste.
    c. Learn about ETP Detection of heavy metals in milk.
    d. Detection of pesticide residue in milk.
    e. Detection of antibiotics.
    f. Estimation of BOD and COD.
    g. Conventional and modern treatment methods of dairy waste.
6. Research and Development
    a. Work at Research and Development department with guidelines of senior workers and learn various aspects involved in development of new product.
7. Practice on managerial skills to run a plant

Assessment

Students who underwent the In-plant training should submit a report based on the daily routine activities that performed by them in the dairy processing unit. Also, they should submit report on the daily activities that they carried out with the details of date and timing. After the successful completion of In-plant training an examination along with a viva voce will be conducted and evaluated.