SYLLABUS

B.Voc / B.Voc (Honors)

Dairy Production & Technology

(Effect From July 2024)

DEEN DAYAL UPADHYAY – KAUSHAL KENDRA

THE GANDHIGRAM RURAL INSTITUTE (DEEMED TO BE UNIVERSITY)

GANDHIGRAM – 624 302,

DINDIGUL DISTRICT.

Semester – wise Credit Distribution with Scheme of Evaluation for

B.Voc / B.Voc (Honors) Dairy Production and Technology Programme

(Effect From July 2024)

SEM	Course Code	Category		Title of the Subject	No. of Credits	Max.Marks		
		NSQF	NEP			Mid	ESE	Total
I	24ENUA1101	GEC	AEC-1	Essential English : Basic	3	40	60	100
		GEC	MD-1	Inter Departmental Elective	3	40	60	100
	24PEUV0001	GEC	VAC-1	Yoga and Fitness	2	50	-	50
	24DTVV1101	GEC	VAC-2	Dairy Development Plans	4	40	60	100
				General Education Component	**12**			
	24DTVS1102	SDC	SEC-1	Milk Procurement	3	40	60	100
	24DTVC1103	SDC	Major -1	Dairy Hygiene and Public Health	4	40	60	100
	24DTVC1104	SDC	Major -2	Dairy Cattle Production	4	40	60	100
	24DTVC1105	SDC	Major -3	Dairy Cattle Production-Practical	3	60	40	100
	24DTVE1106	SDC	Internship -1	Dairy Farming Practices	4	100	-	100
				Skill Development Component	**18**			
				Total Credits	**30**			
	NSQF/ NHEQF Level			**4**				
	NCrF/ UCF Level			**NA**				
	Job Role / Qualification Pack			**Milk Procurement Assistant**				
	Award / NSQF Exit Qualification			**Certificate in Dairy Production and Technology**				

SEM	Course Code	Category		Title of the Subject	No. of Credits	Max.Marks		
		NSQF	NEP			Mid	ESE	Total
II	24ENVA1201	GEC	AEC-2	Essential English : Intermediate	3	40	60	100
	24DTVV1201	GEC	VAC-3	Environmental Studies and Disaster Management	3	40	60	100
	24DTVV1202	GEC	VAC-4	Food Safety and Quality Standards	3	40	60	100
	24CSVI1201	GEC	MD –2	Computational Skills: Digital Marketing Lab	(0+3)	60	40	100
				General Education Component	**12**			
	24DTVC1203	SDC	Major -4	Refrigeration and Steam Generation in Dairy Industry	4	40	60	100
	24DTVC1204	SDC	Major -5	Chemistry of Milk	4	40	60	100
	24DTVS1205	SDC	SEC-2	Chemistry of Milk – Practical	4	60	40	100
	24DTVE1206	SDC	Internship-2	Rural Milk Collection Centre	6	100	-	100
				Skill Development Component	**18**			
				Total Credits	**30**			
	NSQF/ NHEQF Level			**5**				
	NCrF/ UCF Level			**4.5**				
	Job Role / Qualification Pack			**Operator in Milk Collection Centre**				
	NSQF: Exit Qualification			**Diploma in Dairy Production and Technology**				
	NCrF: Exit Qualification			**Under Graduate Certificate in Dairy Production and Technology**				

SEM	Course Code	Category		Title of the Subject	No. of Credits	Max.Marks		
		NSQF	NEP			Mid	ESE	Total
III	24DTVA2301	GEC	AEC- 3	IT Application in Dairy Industry	3	40	60	100
	24CSVI2102	GEC	MD-3	Computational Skills: Web Designing Lab	(0+3)	60	40	100
	24DTVB2302	GEC	Minor – 1	Milk Adulteration and Contamination	3	40	60	100
	24DTVB2303	GEC	Minor – 2	Occupational Hazards and Safety in Dairy Industry	3	40	60	100
				General Education Component	**12**			
	24DTVC2304	SDC	Major – 6	Market Milk	3	40	60	100
	24DTVC2305	SDC	Major – 7	Microbiology of Milk	3	40	60	100
	24DTVS2306	SDC	SEC-3	Market Milk - Practical	3	60	40	100
	24DTVS2307	SDC	SEC-4	Microbiology of Milk - Practical	3	60	40	100
	24DTVE2308	SDC	Internship -3	Dairy Plant – Milk Reception	6	100	-	100
				Skill Development Component	**18**			
				Total Credits	**30**			

Sem	Course Code	Category		Title of the Subject	No. of Credits	Max.Marks		
		NSQF	NEP			Mid	ESE	Total
IV	24ARVA2201	GEC	AEC -4	Introduction to Statistics	3	40	60	100
	24GTPUV1001 /24GTPIV1001	GEC	VAC -5	Let us Know Gandhi	2	20	30	50
	24DTVB2401	GEC	Minor -3	Dairy Plant Design and Layout	3	40	60	100
	24DTVB2402	GEC	Minor -4	Dairy Plant Management	4	40	60	100
				General Education Component	**12**			
	24DTVC2403	SDC	Major –8	Dairy Equipment Operation and Maintenance	3	40	60	100
	24DTVC2404	SDC	Major - 9	Technology of Fat and Protein Rich Milk Products	3	40	60	100
	24DTVC2405	SDC	Major -10	Dairy Plant Engineering and Management – Practical	3	60	40	100
	24DTVC2406	SDC	Major-11	Fat and Protein Rich Milk Products – Practical	3	60	40	100
	24DTVE2407	SDC	Internship -4	Dairy Plant – Quality Control	6	100	-	100
				Skill Development Component	**18**			
				Total Credits	**30**			
	NSQF/ NHEQF Level			**6**				
	NCrF/ UCF Level			**5**				
	Job Role / Qualification Pack			**Lab Technician in Dairy Plant**				
	NSQF: Exit Qualification			**Advanced Diploma in Dairy Production and Technology**				
	NCrF: Exit Qualification			**Under Graduate Diploma in Dairy Production and Technology**				

SEM	Course Code	Category		Title of the Subject	No. of Credits	Max.Marks		
		NSQF	NEP			Mid	ESE	Total
V	24DTVB3501	GEC	Minor – 5	Dairy Extension and Entrepreneurship	4	40	60	100
	24DTVB3502	GEC	Minor – 6	Packaging and Judging of Milk Products	4	40	60	100
	24DTVC3503	GEC	Major – 12	Quality Monitoring in Dairy Industry	4	40	60	100
				General Education Component	**12**			
	24DTVC3504	SDC	Major –13	Technology of Concentrated and Dried Milk Products	4	40	60	100
	24DTVC3505	SDC	Major –14	Technology of Traditional Milk Products	4	60	40	100
	24DTVC3506	SDC	Major –15	Traditional Milk Products – Practical	4	60	40	100
	24DTVE3507	SDC	Internship-5	Dairy Product Development – Experiential Learning	6	100	-	100
				Skill Development Component	**18**			
				Total Credits	**30**			

SEM	Course Code	Pattern		Title of the Subject	No. of Credits	Max.Marks		
		NSQF	NEP			Mid	ESE	Total
VI	24DTVB3601	GEC	Minor –7	Waste Disposal and Effluent Treatment	4	40	60	100
	24DTVB3602	GEC	Minor –8	Milk By Products Utilization	4	40	60	100
	24DTVB3603	GEC	Minor -9	Dairy Economics and Marketing	4	40	60	100
				General Education Component	**12**			
	24DTVC3604	SDC	Major – 16	Technology of Cultured and Frozen Milk Products	4	40	60	100
	24DTVC3605	SDC	Major – 17	Cultured, Frozen and Dried Milk Products -Practical	4	60	40	100
	24DTVS3606	SDC	SEC-5	Dairy Novelties and Modeling (Mini – Project)	4	100	-	100
	24DTVE3607	SDC	Internship-6	Dairy Plant – Overall Industry	6	100	-	100
				Skill Development Component	**18**			
				Total Credits	**30**			
	NSQF/ NHEQF Level			**7**				
	NCrF/ UCF Level			**5.5**				
	Job Role / Qualification Pack			**Technical officer in Dairy Plant / Dairy Entrepreneur**				
	NSQF: Exit Qualification			**B.Voc in Dairy Production and Technology**				
	NCrF: Exit Qualification			**Under Graduate Degree in Dairy Production and Technology**				

SEM	Course Code	Pattern		Title of the Subject	No. of Credits	Max.Marks		
		NSQF	NEP			Mid	ESE	Total
VII	**Basket –I : Specialization : Dairy Processing Technology**							
		GEC	SEC-6	Research Methods	4	40	60	100
	24DTVC4701	GEC	Major –18	Advances in Dairy Processing	4	40	60	100
	24DTVC4702	GEC	Major –19	Functional Dairy Products	4	40	60	100
				General Education Component	**12**			
	24DTVC4703	SDC	Major –20	Advances in Dairy Processing – Practical	4	60	40	100
	24DTVC4704	SDC	Major –21	Functional Dairy Products – Practical	4	60	40	100
	24DTVE4709	SDC	Internship-7	Dairy Plant: Research & Development Section	10	100	-	100
				Skill Development Component	**18**			
				Total Credits	**30**			
	OR							
	Basket –II : Specialization : Dairy Quality Management							
		GEC	SEC-6	Research Methods	4	40	60	100
	24DTVC4705	GEC	Major –18	Chemistry of Milk Products	4	40	60	100
	24DTVC4706	GEC	Major –19	Microbiology of Milk Products	4	40	60	100
				General Education Component	**12**			
	24DTVC4707	SDC	Major –20	Chemical of Milk Products – Practical	4	60	40	100
	24DTVC4708	SDC	Major –21	Microbiological of Milk Products – Practical	4	60	40	100
	24DTVE4709	SDC	Internship-7	Dairy Plant : Research & Development Section	10	100	-	100
				Skill Development Component	**18**			
				Total Credits	**30**			

SEM	Course Code	Pattern		Title of the Subject	No. of Credits	Max.Marks		
		NSQF	NEP			Mid	ESE	Total
VIII	24DTVS4801	GEC	SEC-7	Credit Seminar	5	100	-	100
	24DTVC4802	SDC	Major –22	Project	25	150	50	200
				Total Credits	**30**			
	NSQF/ NHEQF Level			**8**				
	NCrF/ UCF Level			**6**				
	Job Role / Qualification Pack			**Deputy Manager in Dairy Plant**				
	NSQF: Exit Qualification			**Post Graduate Diploma in Dairy Production and Technology**				
	NCrF: Exit Qualification			**B.Voc (Honors) in Dairy Production and Technology**				

MULTI DICIPLINARY COURSES FOR INTERDEPARTMENT LEVEL (UG)

SEM	Course Code	Category / NEP	Title of the Subject	No. of Credits	Max.Marks		
					Mid	ESE	Total
I	24DTVI1107	MD-1	Milk and Milk Products	3	40	60	100
II	24DTVI1207	MD-2	Dairy Processing Technology	3	40	60	100
III	24DTVI2308	MD-3	Functional Dairy Products	3	40	60	100

SEMESTER – I

Semester	**I**		
Course Code	**24ENUA1101**		
Course Title	**ESSENTIAL ENGLISH: BASIC**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	**New Course**	**Percentage of Revision effected**	
Category	**NSQF**	General Education Component (GEC)	
	NEP	Value Added Course (VAC) -2	
Course Objective	• To introduce the students to the basics of functional English Grammar for everyday use. • To provide them opportunities to improve their essential language skills in English through practice in all language skills. • To facilitate usage of the English language in everyday circumstances		

Unit	**Content**
I.	**Grammar** • Nouns & Pronouns • Adjectives & Determiners • Verbs and Tenses • Auxiliary Verbs
II.	**Oral Communication** • Listening Skills i. Descriptions ii. Story Narrations iii. Short Speeches • Speaking Skills i. Descriptions ii. Conversation Techniques
III.	**Reading & Vocabulary** • Reading comprehension passages • Vocabulary building
IV.	**Writing Skills** • Paragraph writing • Note making • Short Narrative

V.	**English in Everyday Use Reading Aloud** • Face to Face Conversation • Telephone Conversation

Semester	**I**			
Course Code				
Course Title	**INTER DEPARTMENTAL ELECTIVE**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	New Course		**Percentage of Revision effected**	-
Category	**NSQF**	General Education Component (GEC)		
	NEP	Multidisciplinary Course-1		

Semester	**I**			
Course Code	**24PEUV0001**			
Course Title	**YOGA AND FITNESS**			
No. of Credits	**0+2**		**Contact Hours per week**	**2**
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	
Category	**NSQF**	General Education Component (GEC)		
	NEP	Value Added Course (VAC) -2		
Course Objective	Gain the practical knowledge about Health and Fitness through Yogi Practices and Physical activities.			

Unit	**Content**
I.	**Introduction and Scope of Yoga:** Astanga Yoga-Yogaasan ideal system of physical culture–Schools of Yoga-Difference between practice ofAsanas and Physical Exercise-Loosening Exercises in yoga–Suryanamaskar.
II.	**Asana&Practice:**MeditativeAsana:Sukhasana–Padmasana–Vajrasana–StandingAsana:Tadasana–Trikonasana–Vrikshasana–SittingAsana:Baddhakonasana–Paschimottanasana–Ustrasana–Vakrasana–Gomukhasana–ProneAsana:–Bhujangasana–Shalabhasana–Dhanurasana-

	SupineAsana:Pavanamuktasana–Sethubandasana– Navasana
III.	**Practices of Pranayama, Bandhas, Mudras and Kriya:** Sectional Breathing-Nadisuddhi–Bhramari–Bhastrika-Kapalabhati–IntroductiontoBandhas–Mudras–Dharana(Trataka)–Dhyana–Mindfulness–IntroductiontoJalaneti–InstantRelaxationTechnique(IRT)
IV.	**Concept of Fitness & Recreation**: Health related fitness components- BMI-Underweight–Obesity-waist-to-hipratio(WHR)and Minorgames.
V.	**Fitness Parameters:** Isometric Strength: Push-up/wall push-Plank–Wallsit Medicine ball exercises. Shortsprints–4X100meters Brisk Walking-Repeated Jump Sideward and backwardrunfor4X100meters-10metersShuttleRun 4X50meters RopeSkipping-6minuteWalk-3-4Kmsofbriskwalk/3500steps Introduction to Yo-Yo intermittent recovery (Level-1) test.
	Reference Books: 1. BarryL.Johnson,andJackK.Nelson.(1988).PracticalMeasurementsforEvaluationinPhysicalEducation,(3rdED).Delhi:SurjeetPublications. 2. EdwardL.Fox,RichardW.BowersandMerleL.Foss.(1989).ThePhysiologicalBasisofPhysicalEducationandAthletics,(3rdED).NewYork:W.M.C.BrownPublishers. 3. JayHoffman.(2002).PhysiologicalAspectsofSportsTrainingPerformance. ChampaignIllinois:HumanKineticsPublishersInc. 4. ShriKrishna.(1996).EssenceofPranayama.KaivalyadhamaAshram,Lonavla,India. 5. YogaanInstructionBooklet.(2018).VivekandaKendraPrakashanTrust,Chennai. YogaforHealth.(2003).InstituteofNaturopathy&YogicSciences.Bangalore

Semester	**I**			
Course Code	**24DTVV1101**			
Course Title	**DAIRY DEVELOPMENT PLANS**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	
Category	**NSQF**	General Education Component (GEC)		
	NEP	Value Added Course (VAC) -2		
Course Objective	• To enlighten the students about the dairy development. • To understand the organizational structure of dairy co-operatives at village, district and state levels.			
Learning Outcome	• 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	**Content**
I.	Role of dairying in Indian economy and rural development. Dairying as source of additional income and employment–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.
II.	Introduction Dairy Development in Pre-Independence Period-Dairy Development from 1947-1970- Government Projects-Non-Government Organization Councils, Key village scheme-Intensive Cattle Development Programme (ICDP) - Intensive Dairy Development Programme (IDDP). NLM, Rastriya Gokula Mission-Institution for dairy development: NDRI, NDDB
III.	Dairy Co-Operatives : Objectives-Introduction - History of Co-operatives - Principles

	of Co-operatives Open and Voluntary membership- Democratic Governance- Limited Return on Equity- Equitable Distribution of Surplus- Co-operatives among co-operatives- Co-operative Education- Indian Co-operative Societies Act
IV.	Co-operatives Movement in India -Anand pattern Co-operatives-Co-operatives in Dairy Development-Three Tier Structure of Dairy Co-operatives -Milk Federations- National Co-operative Dairy federation of India- National Milk Grid
V.	NDPI-NPBB-NPCBB-Dairy development under various five year plan- Livestock Insurance Scheme-SWOT Analysis of Indian dairy industry
References:	
Text Books	1. Dairy India Year Book. 2007 & 2017. P.R. Gupta Publ., New Delhi. 2. Anantha Krishnan, C.P., (1991), Technology of milk processing, Sri Lakshmi Publications, Chennai -10. 3. Mudgal, V.D., Singhal, K.K. and Sharma, D.D. 1995. Dairy animal production.1st ed. International Book Distributing Co., Lucknow. 4. Sastry, N.S.R. and Thomas, C.K. 1996. Livestock Production Management. Kalyani Publ., New Delhi.
Reference Books	1. Khurody, D.N. (1974). Dairying in India, Asia Publishing House, New Delhi 2. John, P. (1975). Economics of Dairy Development, Parbhat Parkashan, Patna (Bihar) 3. Govt. of India, Ministry of Agriculture, Department of Animal Husbandry & Dairying (1998, 1999, 2000, 2001) Basic Animal Husbandry Statistics. 4. 17th Livestock Census Report. (2003). Ministry of Agriculture, Department of Animal Husbandry & Dairying.
Web Resources	• http://ecoursesonline.iasri.res.in/course/ • https://agrimoon.com/book/

Semester	**I**			
Course Code	**24DTVS1102**			
Course Title	**MILK PROCUREMENT**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Skill Enhancement Course -1		
Course Objective	• 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	Content
I.	**Introduction:** Importance of milk procurement in India and Tamilnadu. Milk procurement and pricing pattern in India. Milk production: Principles of milk production- selection of milk shed area – milking practices - milk handling.
II.	**Milk procurement:** Source of milk procurement – classification. Organization of rural milk procurement. Collection of milk – definition - classification- methods, milk collection centers and their functions.
III.	**Milk Chilling**: Definition - types of milk chilling - methods of chilling – importance of milk chilling - merits and demerits – Cold storage chain. Automatic Bulk Chilling.
IV.	**Transportation of milk:** Modes of transport – earlier methods – recent developments – selection of mode of transportation of milk.

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

Text Books

1. Dairy India year book 2007 & 2017, A- 25 Priyadarshinivihar, Delhi 110092, India.
2. Jagadish Prasad (1992), Principles and Practices of Dairy FarmManagement, KalyaniPublishers, Ludhiana.
3. Ramasamy. D. 1999. Dairy technologist hand book, International book distributing Co.Luknow.42.
4. Robinson (1986), Modern Dairy Technology, Vol.I, Advances in Milk Processing, Chapman and Hall India, Madras.

Reference Books

1. Sukumar De (1980), Outlines of Dairy Technology, Oxford University Press, NewDelhi.
2. Walstra, P. Wouters, J.T.M. and Geurts, T.J. 2006. Dairy Science and Technology. CRCPress, New York.

Web Resources

- http: //e course online.iasri.in/course/index.php?categoryid=11
- https:// agrimoon.com/book/

Semester	**I**			
Course Code	**24DTVC1103**			
Course Title	**DAIRY HYGIENE AND PUBLIC HEALTH**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Major -1		

Course Objective	• To provide knowledge in hygiene practices so as to improve health status of animal and to produce clean milk • 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 learn on the process and importance of cleaning and sanitization. • It provides information about the public organizations involved in hygiene practices.

Unit	Content
I.	**Dairy Hygiene:** Water Hygiene: Definition, water requirement - uses of water in Dairy farm. Air Hygiene: Definition – air quality - indoor and outside air to animal house. Animal hygiene, Milker hygiene and Utensils/equipment hygiene. Ventilation of animal house.
II.	**Dairy Farm Waste Management**: Waste from livestock production - solid waste and liquid waste - Method of disposal. Construction of manure pit - Composting, vermin-composting, biogas production and value added manure management.
III.	**Cleaning and sanitation:** Sanitizers and Disinfectants: definition - types - ideal

	properties of sanitizer and disinfectants - principles of cleaning and sanitation - application to dairy farm premises. CIP: definition, applicable to dairy machineries. Hygienic handling: methods of cleaning dairy equipment.
IV.	**Public health concept:** Public Health set up at State - District –Block level - Village level – organization - functions. Public Health Laws: Definition – importance – Statutory laws - The Tamil Nadu Public Health Act.
V.	**Public health associated with milk:** Indian scenario of milk hygiene and public health. Heavy metal contamination in milk - Pesticide residues in milk - Drugs, toxicity, allergy - limitation and precautions.
References:	
Text Books	1. Jagadish Prasad, 2002. Principles and practices of Dairy Farm Management, 3rd Ed. Kalyani Publishers, Ludhiana. 2. Harry S. Mustard.,(1960) An Introduction to Public Health, The Macmillan Co., New York. 3. V.K.Muthu., (2005) A Short Book of Public Health, JAPEE Brother Medical Pub.(P)Ltd New Delhi. 4. Singh, R.R.B., Sabikhi, L., Patil, G.R. and Sharma, N. 2003. Clean Milk Production – Strategies and Interventions. NDRI Publication No. 10/2003
Reference Books	1. ICAR, 2013. Hand book of Animal Husbandry, 4thEd.ICAR Publication, Pusa, New Delhi. 2. Sastry, N.S.R., C.K.Thomas and R.A.Singh, 2015. Livestock Production Management, 4thEd.Kalyani Publishers, New Delhi. 3. Banerjee, G.C., 2006. Text book of Animal Husbandry 8thEd.Oxford and IBH Publishing Company Ltd., New Delhi.
Web Resources	• http://ecoursesonline.iasri.res.in/course/index.php?categoryid=11 • https://agrimoon.com/book/

Semester	**I**			
Course Code	**24DTVC1104**			
Course Title	**DAIRY CATTLE PRODUCTION**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Major -2		

Course Objective	• The Dairy Cattle Production course is designed to impart technical knowledge and skills required to successfully run a dairy farm enterprise by developing competencies concerning the selection and breeding of dairy cattle, management of animals of different physiological status, nutrition, health, housing and feeding.
Learning Outcome	1. Identify various breeds of cattle and buffalo by viewing photographs or live animals. 2. Identify the signs of estrus and right time for insemination 3. Know the correct amount and time frame for colostrum intake 4. Ability to prepare plans for housing of dairy cows

Unit	**Content**
I.	**Breeds and Breeding:** classification of breeds of cattle - Indigenous and exotic breeds: Red Sindhi – Sahiwal - Gir – Kangayam – Jersey - Holstein Friesian - Brown Swiss. Buffalo – Murrah – Surti - Nili-Ravi. Selection of dairy cattle – choice of breed oestrous cycle - signs of heat -concept of breeding – Inbreeding – Out breeding – Crisscrossing - Triple crossing – Grading up- Artificial Insemination - Advantages of AI
II.	**Housing**: Handling and restraining of dairy cow – casting – putting nose ring and string – dehorning – castration – dentition and ageing – Identification of dairy cow – tattooing – branding – Selection of site for the farm buildings – planning and designing construction details – Foundation – wall, floor, roof, manger, drain – Types of animal housing – conventional barn – loose housing

III.	**Classification of feeds and fodder:** Ration- Balanced ration- Desirable Characteristics of ration- classification of feeds and fodder- Concentrate- and Roughage's –fodder preservation- hay making- Silage making.
IV.	**Management of calf, heifer and pregnant animals:** Care of calf at birth – Muconium - Colostrum feeding - System of raising calves - Milk replacer - Calf starter - Common ailments and their control – 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.
V.	**Management of Lactating Animals**: Anatomy of udder and physiology of milk secretion - factors affecting milk yield and quality – General care of lactating animals - Strategies to improve fat and SNF content of milk - Production of clean milk – preparation for milking – methods of milking. Cleaning and disinfection of dairy farm and milk room and record management. Milk fever - mastitis

References:

Text Books	1. ICAR, 2013. Hand book of Animal Husbandry, 4th Ed. ICAR Publication, Pusa, New Delhi. 2. Banerjee, G.C., 2010. Text book of Animal Husbandry 8th Ed.Oxford and IBH Publishing Company Ltd., New Delhi.
Reference Books	1. Sastry, N.S.R., C.K.Thomas and R.A.Singh, 2015. Livestock Production Management, 4th Ed.Kalyani Publishers, New Delhi. 2. Ranjhan, S.K., and N.N.Pathak, 2010. Text book on buffalo production, 4 Ed. Vikas Publishing House Pvt. Ltd., New Delhi
Web Resources	• TNAU agritech portal • www.agrimoon.com

Semester	**I**			
Course Code	**24DTVC1105**			
Course Title	**DAIRY CATTLE PRODUCTION - PRACTICAL**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	Revised Course		**Percentage of Revision effected**	
Category	**NSQF**	Skill Development Component		
	NEP	Major -3		
Learning Outcome	• To provide hands-on experiences with the principles and practices essential in the production of clean milk for personal economic development in particular and community development in general.			

Practicals

1. Familiarizing with body parts of a cow
2. Identification of breeds of cattle and buffalo
3. Heat detection in cows and buffaloes
4. Demonstration of semen collection and evaluation
5. Demonstration of insemination
6. Ear tagging and tattooing
7. Dehorning
8. Casting and Castration
9. Preparation of plans for housing of dairy cattle
10. Hands on training in milking

Semester	**I**		
Course Code	**24DTVE1106**		
Course Title	**DAIRY FARMING PRACTICES (INTERNSHIP -1)**		
No. of Credits	4	**Contact Hours per week**	4
New / Revised Course	Revised Course	**Percentage of Revision effected**	20
Category	**NSQF**	Skill Development Component	
	NEP	Field Study / Community Engagement	
Course 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 or a private sector dairy farm. They have to study and gain skills on managing dairy farm. 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 Schedule of animals
4. Diagnose Heat Period
5. Hands on training in milking

Farm management

1. Maintenance of dairy equipment

2. Milk collections and transportation
3. Maintenance of stores for dairy farm
4. Maintaining of records and registers
5. Techniques in disposal of farm waste

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 dairy farm the evaluation will be based an examination along with viva voce.

SEMESTER – II

Semester	**II**			
Course Code	**24ENUA1201**			
Course Title	**ESSENTIAL ENGLISH: INTERMEDIATE**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	
Category	**NSQF**	General Education Component (GEC)		
	NEP	Value Added Course (VAC) -2		
Course Objective	• To help the students understand the intricacies of English Grammar for everyday use; • To help them improve their essential language skills in English; • To encourage them to use English in their personal and professional spheres			

Unit	**Content**
I.	**Grammar** • Prepositions & Prepositional phrases • Conjunctions • Direct & Indirect Speech • Sentences • Punctuation
II.	**Oral Communication** • Listening Skills i. Long Narratives, Recorded speeches ii. Movie clips • Speaking Skills i. Narrations & Public speaking ii. Debating
III.	**Reading & Vocabulary** • Reading comprehension passages • Vocabulary building
IV.	**Writing Skills** • Precis Writing • Personal Letter Writing • General Essay Writing
V.	**English in Everyday Use** • Short speeches • Debates • Silent Rapid Reading

Semester	**II**			
Course Code	**24DTVV1201**			
Course Title	**ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	General Education Component (GEC)		
	NEP	Value Added Course (VAC)-3		

Course Objective	• 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	Content
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, Food resources: Effects of modern agriculture, fertilizer- pesticide problems-energy Resources: Growing energy needs renewable and non renewable energy source
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.

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.
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.
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.
Reference Books	1. Environmental Studies, 2005, Benny Joseph, Tata Macgraw – Hill Publishing Company, New Delhi 2. Panchayats in Disaster: Preparedness and Management, 2009, palanithurai, G., Concepts Publishing company

Semester	**II**		
Course Code	**24DTVV1202**		
Course Title	**FOOD SAFETY AND QUALITY STANDARDS**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	**Revised Course**	**Percentage of Revision effected**	25
Category	**NSQF**	General Education Component (GEC)	
	NEP	Value Added Course-4	
Course Objective	• 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	Content
I.	**Current trends in food safety:** definition – responsibilities - current trends in food safety - emerging pathogens- Ecology and survival strategy of pathogens in foods. Novel technology in control of food based pathogens. Concepts in food toxicology.
II.	**Quality Management System:** Introduction to Risk Analysis, Risk Management, Risk Assessment and Risk Communication. QMS**:** definition – terminology - Principles of quality management systems – benefits of quality management systems. SOP - Verification and validation of control measures.
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.
IV.	**Regulatory systems/agencies- I:** Role of national organization - FSSAI. Significance of APEDA in dairy industry.

V.	**Regulatory systems/agencies- II:** Role of International organizations such as ISO 22000-2018, HACCP, TQM and GMP in dairy industry.
References:	
Text Books	1. Gould, W.A. and Gould, R.W. 1988. Total Quality Assurance a for the Food Industries, CTI Publications Inc, Baltimore. 2. Gupta, A., Sharma, P.C. and Verma, A.K. (2010). Application of food safety, management system (HACCP) in food industry. *Indian Food Industry*, 29 (2) 39-46. 3. Jacob Faergemand and Dort Jespersen 2005. Key elements and benefits of ISO 22000 , 18, ISO Management System. 4. Bureau of Indian Standards, Manak Bhavan , 9 Bahadur Shah Zafar Marg, New Delhi-110002. 5. Havelaar, A. H., Nauta, M. J., Jansen, J. T., 2004. Fine-tuning food safety objectives and risk assessment. International Journal of Food Microbiology, 93, 11–29.
Reference Books	1. Jessica Vapnek and Melvin Spreij. 2005. Prespectives and guidelines on food legislation with a new model food law. developement law services FAO legal Office. FAO of the UN, Rome. 2. Margret Will and Doris Guenther (Eds). 2007. Food quality and safety standards as required by the EU law and private industry, 2nd Edition.
Web Resources	• http://ecoursesonline.iasri.res.in/course/view • www.health.gov.au/internet/wcms/Publishing.nsf/Content/health-pubs-jetacar-cnt.htm/$FILE/jetacar.pdf Accessed 27 June 2005. • www.dti.gov.uk/quality/qms

Semester	**II**			
Course Code	**24CSVI1201**			
Course Title	**Digital Marketing Lab**			
No. of Credits	**0+3**		**Contact Hours per week**	**3**
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	
Category	**NSQF**	General Education Component (GEC)		
	NEP	Value Added Course (VAC) -2		
Course Objective	**The Course aims to:** • Familiarize students with the concept of digital marketing and its current and future evolutions. • Identify impact of digital space and digital marketing in reaching out to customers. Discover effective methods for gathering, arranging, and handling social media data.			
Cognitive Level	**K1-K3**			

Lab Exercise

1. Creating Face book page uploading contacts for invitation
2. Exercise on fan page: wall posting to increase fans on fan page
3. Marketing on fan page (with examples)
4. Creating Promotional banner through Canva
5. Face book Promotion using Banners
6. Creating the poll in Face Book fan Page.
7. Face book advertising
8. Best practices for Face book advertising
9. Payment module- CPC vs CPM vs CPA
10. LinkedIn Marketing
11. Understanding LinkedIn Company profile.
12. Understanding LinkedIn Individual profiles
13. Understanding LinkedIn groups
14. LinkedIn publishing
15. Twitter Marketing
16. Twitter Advertising
17. Uploading videos on video marketing with thumbnails.
18. YouTube for business.
19. Sending bulk E-Mail.

Semester	**II**		
Course Code	**24DTVC1203**		
Course Title	**REFRIGERATION AND STEAM GENERATION IN DAIRY INDUSTRY**		
No. of Credits	4	**Contact Hours per week**	4
New / Revised Course	Revised Course	**Percentage of Revision effected**	50
Category	**NSQF**	Skill Development Component	
	NEP	Major -4	
Course Objective	• To understand the principles of Refrigeration. • To obtain knowledge on working at chilling plant. • To acquire knowledge on construction of boilers and tools • To study the theory of heat transfer and formation of steam		
Learning Outcome	• Students acquire knowledge on types of refrigeration cycles • Students will learn the process of refrigeration • Students get to know about the construction of boilers and its accessories. • This course provides information about the importance and application of steam.		

Unit	**Content**
I.	**Introduction:** Importance of refrigeration in dairy industry. Units of refrigeration. Refrigerants: Definition – types – desirable characteristics of refrigerants – properties of refrigerants and comparison. Merits and demerits of refrigeration in milk.
II.	**Refrigeration cycles:** Methods of refrigeration : Different types of refrigeration cycles – Vapour compression refrigeration system – compressor, condenser and evaporator – block diagram of vapour compression refrigeration system .
III.	**Refrigeration plant and control devices:** Automatic expansion valve – solenoid valve- pressure control and thermostat. Cooling tower. Ice bank systems. Factors affecting the performance of refrigeration plant – Efficient use of refrigeration Common troubles in refrigeration system .
IV.	**Steam and steam generators/boilers:** Wet, dry and superheated steam; Formation of

	Steam, use of steam tables. Boiler: Types of boiler, Types of fuels, constructional features and operations of vertical fire tube, horizontal return flow and automatic boilers. Boiler accessories and their uses. IBR /Non IBR.
V.	**Performance and efficiency of boiler:** Heat Balance Sheet of a Boiler, Methods of Minimizing the Heat Loss through Different sources. Performance of Boilers. Boiler Efficiency, Boiler Horse Power, Heat Losses in a Boiler. Boiler safety measures.
References:	
Text Books	1. Arora, S. C. and Domkundwar, S. 1989. A Course in Refrigeration and air conditioning. 5th ed. Dhanpat Rai and Sons, Delhi. 2. Arora, C. P. 2000. Refrigeration and air conditioning. Tata McGraw-Hill, New Delhi. 3. Prashad, M. 2007. Refrigeration and air conditioning. New Age International, New Delhi. 4. GostaBylund (1995), Dairy processing hand book, Tetra pack processing systems AB, Swedwn
Reference Books	1. James. N. Marner (1975), Principles of dairy processing, wiley eastern limited, New Delhi. 2. Ramasamy D, 1999. Dairy Technologists Hand Book, International Book Distributing Co, Lucknow 3. Tuffel Ahmad 1995, Dairy Plant Engineering and Management, KitabMachal Distributers, New Delhi
Web Resources	• http://ecoursesonline.iasri.res.in/course/view.php?id=84 • https://agrimoon.com/book/

Semester	**II**			
Course Code	**24DTVC1204**			
Course Title	**CHEMISTRY OF MILK**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Major -5		
Course Objective	• 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	Content
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.
II.	**Milk Carbohydrates**: Definition, classification, Lactose structures, physical forms, status of lactose in milk, uses of lactose.
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 and Saponification value.
IV.	**Milk Proteins:** Classification, isolation, major and minor milk proteins –Properties of milk proteins – hydration and solubility.
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. Tata McGrawHill Publishing Co.Pvt.Ltd., New Delhi. 2. Mathur MP, Roy DD and Dinakar P.1999. *Textbook of Dairy Chemistry*. ICAR. 3. Sukumar De (1980), Outlines of Dairy Technology, Oxford University Press, NewDelhi. 4. Walstra, P. and Jenness, R. (1984) Dairy Chemistry and Physics. Wiley – InterSci.Publ., John Wiley and Sons, USA.
Reference Books	1. Webb, B.H., Johonson, A.H., and Alford, J.A. (Eds) (2008). Fundamentals of Dairy Chemistry, CBB Publishers and Distributors, New Delhi. 2. Wong N.P, Jenness.R. Keeney.M. Marth E.H (1998); Fundamentals of Dairy Chemistry, CBB Publishers and Distributors, New Delhi.
Web Resources	• http: //e course online.iasri.in/course/index.php?categoryid=11 • https:// agrimoon.com/book/

Semester	**II**		
Course Code	**24DTVS1205**		
Course Title	**CHEMISTRY OF MILK – PRACTICAL**		
No. of Credits	4	**Contact Hours per week**	4
New / Revised Course	**Revised Course**	**Percentage of Revision effected**	50
Category	**NSQF**	Skill Development Component	
	NEP	Skill Enhancement Course -2	
Learning Outcome	• Sampling of milk for physical and chemical examination • 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.		

Practicals

1. Platform tests for milk
2. Sediment test
3. Clots on boiling
4. Determination of specific gravity of milk by lactometer
5. Estimation of fat by Gerber's method
6. Estimation of fat by milk analyser
7. Estimation of lactose
8. Estimation of protein
9. Estimation of Total Solids and SNF
10. Determination of titratable acidity in milk
11. Determination of heat stability of milk by Alcohol test
12. Detection of adulteration in milk

Semester	**II**		
Course Code	**24DTVE1206**		
Course Title	**RURAL MILK COLLECTION CENTRE (INTERNSHIP -2)**		
No. of Credits	6	**Contact Hours per week**	6
New / Revised Course	Revised Course	**Percentage of Revision effected**	20
Category	**NSQF**	Skill Development Component	
	NEP	Field Study / Community Engagement	
Course Objective	• To provide practical exposure in refrigeration and chilling operations in milk collection centre		
Learning Outcome	• Students will attain practical knowledge by performing assigned work. • Students will learn to operate chilling unit and BMC. • Students will learn documentation of milk at collection centre.		

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 will be conducted along with viva voce.

SEMESTER – III

Semester	**III**		
Course Code	**24DTVA2301**		
Course Title	**IT APPLICATION IN DAIRY INDUSTRY**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	Revised Course	**Percentage of Revision effected**	25
Category	**NSQF**	Skill Development Component	
	NEP	Ability Enhancement Course-3	
Course Objective	• 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	Content
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.
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
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.
IV.	**Plant Automation:** Meaning & Definition – types of automation systems – fixed automation – programmable automation – flexible automation – integrated automation

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

Semester	**III**			
Course Code	**24CSVI2102**			
Course Title	**WEB DESIGNING LAB**			
No. of Credits	**0+3**		**Contact Hours per week**	**3**
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	
Category	**NSQF**	General Education Component (GEC)		
	NEP	Value Added Course (VAC) -2		
Course Objective	**The Course aims to:** • Familiarize students with the concept of digital marketing and its current and future evolutions. • Identify impact of digital space and digital marketing in reaching out to customers. • Learn the importance of Search Engine optimization and marketing. • Acquire the skill of making efficient use of the digital assertions on social media platforms. • Discover effective methods for gathering, arranging, and			

	handling social media data.
Cognitive Level	**K1-K3**
Lab Exercise	

Write a code using HTML/CSS/XML/Java script to the following.

HTML

1. Apply the formatting tags.
2. Implement the different type of List tags.
3. Table and Table formatting tags.
4. Hyperlink creation.
5. Form and Form elements.
6. Frames.

CSS

7. Design text and paragraphs.
8. Tables with different borders styles

JAVASCRIPT

9. Using variables and operators.
10. Control statements.
11. Validation using functions.
12. Simple questionnaire with validation.
13. Domain-specific application.

Semester	**III**			
Course Code	**24DTVB2302**			
Course Title	**MILK ADULTERATION AND CONTAMINATION**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	Revised Course		**Percentage of Revision effected**	50
Category	**NSQF**	General Education Component (GEC)		
	NEP	Minor -1		
Course Objective	• To understand the fundamentals of food quality and control procedures. • To provide hands on training about adulteration and detection methods.			
Learning Outcome	• This course provides knowledge on various adulterants that added to milk • It provides knowledge to students on various tests to detect adulterants.			

Unit	Content
I.	**Adulteration and contaminants:** Definition, classification of adulterants, List of foods commonly adulterated, harmful effects of adulterants and contaminants.
II.	**Quality testing of adulterated milk:** starch, sugar, glucose and salt – formaldehyde - hydrogen peroxide detection methods
III.	**Chemical Contaminants in Milk**: Introduction- Source- Industry-Other sources- Metals and metalloids- Industrial Chemicals- Plastics- Risk Assessment and Monitoring- Remediation.
IV.	**Procedure for Milk Recall:** Introduction-Food recall-purpose of guideline-role of food authority-role of the industry-Food recall plan-conducting recall plan-Assemble your recall management team-Inform the authority-identify all products to be recalled –prepare and distribute the information of recall-Prepare the distribution list-verify the effectiveness of the recall-control of the recalled products-fix the cause of the recall.
V.	**Recall Plan:** Recall procedure-roles and responsibilities –Recall management team-Recall actions and documentation-Decision to recall-Notification of a product recall-Regaining control of affected stock-Recall status report-post recall report-Termination of a recall-Follow up action.

References:

Text Books	1. Farrington and Woll. 2010. Testing milk and its products, Axis Books Publ, Jodhpur. 2. Gould, W.A. and Gould, R.W. 2005. Total Quality Assurance for the Food Industries, CTI Publications Inc, Baltimore 3. SandeepTomar. 2013, Dairy products research and analysis, Oxford book company, Jaipur.
Reference Books	1. IDF. (1997). Monograph on Residues and Contaminants in Milk and Milk Products. Special Issue. Int. Dairy Fed., Brussels. 2. ISI. (1981). Handbook of food analysis. IS: SP: 18, Part XI. Dairy Products. Bureau of Indian Standards, New Delhi. 3. Wadhwa, B.K., Sharma, V. and Sharma, R. (2002). Status and control of pesticide residues in milk and milk products. *Indian Dairyman*.54(3)59-63
Web Resources	• http://ecoursesonline.iasri.res.in/mod/page/view.php?id=3852 • https://agrimoon.com/book/

Semester	**III**			
Course Code	**24DTVB2303**			
Course Title	**OCCUPATIONAL HAZARDS AND SAFETY IN DAIRY INDUSTRY**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	Revised Course		**Percentage of Revision effected**	25
Category	**NSQF**	General Education Component (GEC)		
	NEP	Minor -2		
Course Objective	• To learn safety precautions in handling dairy equipment. • To learn first aid methods and practice it on and off the field			
Learning Outcome	• 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	**Content**
I.	**Safety and Health :** Introduction to Safety Management, Safety Management, Safety Policy under Factories Act, Dangerous Machineries Act, Safety Committee, Safety Review, Responsibility of Management, Safety Officers Duties & Responsibilities, Safety Targets. Motivation & Communication as part of Safety Programme. ISO certification.
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.
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.

IV.	**First Aid:** Burns, Fractures, Toxic Ingestion, bleeding, wounds and Bandaging, Artificial Respiration, Techniques of Resuscitation. First Aid Appliances.
V.	**Safety Health Practices:** Health-Cleanness, Disposal of Waste, Ventilation and Temperatures. Safety – Fencing of machineries, Work on or near machinery in motion, Protection against fumes and & gases, Safety offers. 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.
Reference Books	
Web Resources	https://labour.gov.in

Semester	**III**			
Course Code	**24DTVC2304**			
Course Title	**MARKET MILK**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Major -6		
Course Objective	• To provide the knowledge about the liquid milk processing and preservation. • To enlighten the students about the market available processed/special milk.			
Learning Outcome	• 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	Content
I.	**Market milk**: definition – Status of market milk industry in India and abroad –Indian standards – State wise standards. FSSAI Standards.
II.	**Processed milk:** 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.
III.	**Standardized milk:** Scope, definition, standards, method of preparation, storage and nutritional value of Standardized milk – Cow milk – Toned milk – Double toned milk – Full cream milk- Skimmed milk – Recombined milk – Reconstituted milk.
IV.	**Value added milk:** Scope, definition, standards, types, method of preparation, storage and nutritional value of Sterilized milk – Flavoured milk – Vitaminised/irradiated

	milk – Mineral fortified milk – Filled milk – Soft curd milk.
V.	**Modified milk:** ESL milk –Introduction-method and manufacture of ESL milk - heat treatment with micro filtration with bactufugation - comparison of ESL milk and UHT- Aspectic milk - Advantage and Disadvantage of ESL milk and UHT milk

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.
Reference Books	1. Aneja, R.P. 1994. Dairying in India – A Success Story. Publication No. 1994/4. Asia Pacific Association of Agricultural Research Institutions (APAARI), Bangkok. 2. Thompkinson, D.K. and Sabikhi, L. 2012. Quality Milk Production & Processing Technology. Xxvii+ 274 pp. New India Publishing Agency, New Delhi
Web Resources	• http://ecoursesonline.iasri.res.in/mod/page/view.php?id=6099 • https://agrimoon.com/book/

Semester	**III**			
Course Code	**24DTVC2305**			
Course Title	**MICROBIOLOGY OF MILK**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Major -7		
Course Objective	• To understand about various microbes and their characters • To understand the merits and demerits of microbes in the 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	Content
I.	**Introductory dairy microbiology:** Introduction and significance of dairy microbiology, Microbial classification: based on shape, size and arrangement of cells - based on temperature – based on oxygen requirement. Growth of bacteria. Characteristics of pathogenic microorganism.
II.	**Microbiology of Milk and Standards:** Microorganisms associated with milk and their significance, Microbiological standards for raw and heat processed milk, FSSAI standards and grading. MBRT: Test principle – procedure –grading for raw and processed milk.
III.	**Microbial spoilage of milk:** role of microbes in spoilage of milk, Physiological
	grouping; acid producing, gas producing, flavour producing, colour fermentations, proteolytic, lipolytic, sweet curdling, ropiness - causes and preventive measures.

IV.	**Diseases transmitted through Milk:** Food infection, food intoxication and toxi-infection. sources of contaminations - milk borne diseases and implications. Mycotoxin in milk.
V.	**Microbial Interaction**: Introduction, Microbial interactions, antimicrobial substance in milk, bio-preservation, Inhibitors in milk. Bactofugation process.
References:	
Text Books	1. Fernandes, R.2009 . Microbiology Hand book: Dairy Products. Royal Society of Chemistry, Revised ed., London 2. Ramasamy, D., 1999, Dairy Technologist's Hand Book, International book distributing Co., Lucknow. 3. Srivastava.L. (2002)., Hand Book of Milk Microbiology, Daya Publishing House, Delhi.
Reference Books	1. Pelczar.Reid and Chan, 1977 - Microbiology, Tata McGraw-Hill Publishing company Ltd., New Delhi. 2. Yadav, J.S. (1993) A Comprehensive Dairy microbiology, Metropolitan Book Co. Pvt Ltd, 1, NetajiSubashMarg, New Delhi-11002, India. 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.
Web Resources	• http://ecoursesonline.iasri.res.in/course/view.php?id=105 • https://agrimoon.com/book/

Semester	**III**			
Course Code	**24DTVS2306**			
Course Title	**MARKET MILK – PRACTICAL**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Skill Enhancement Course -3		
Course Objective	• To learn about various processes involved in market milk			
Learning Outcome	• Students learn on various procedures for preparation of various market milk. • Students gain knowledge on various parts involved in milk processing.			

Practicals

1. Sampling of milk
2. Plat form test
3. Preparation of pasteurized milk
4. Phosphatase test
5. Preparation of homogenized milk
6. Preparation of recombined milk
7. Preparation of reconstituted milk
8. Preparation of sterilized milk
9. Preparation of flavored milk
10. Turbidity Test
11. Standardization of milk
12. Hands on training on liquid milk processing

Semester	**III**		
Course Code	**24DTVS2307**		
Course Title	**MICROBIOLOGY OF MILK - PRACTICAL**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	**Revised Course**	**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component	
	NEP	Skill Enhancement Course -4	
Course 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		

Practicals

1. Familiarity with common equipments used in microbiology lab
2. Handling of microscopes.
3. Cleaning and sterilization of glassware
4. Preparation of dilution blank
5. Preparation of agar plates and agar slants
6. Preparation of various media.
7. Gram staining technique.
8. Methylene Blue Reduction Test (MBRT)
9. Resazurin Reduction Test (RRT)
10. Standard Plate count test in milk(SPC)
11. Direct microscopic Count in milk (DMC) test
12. Coliform count in milk

Semester	**III**			
Course Code	**24DTVE2308**			
Course Title	**DAIRY PLANT : MILK RECEPTION (INTERNSHIP-3)**			
No. of Credits	6		**Contact Hours per week**	6
New / Revised Course	Revised Course		**Percentage of Revision effected**	25
Category	**NSQF**	Skill Development Component		
	NEP	Field Study / Community Engagement		
Learning Outcome	• Students have to undergo Inplant training at an established dairy unit and should learn about all the following procedure.			

Work Plan

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.

1. 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.

2. 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
3. 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.
4. 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.

SEMESTER – IV

Course Code & Title	INTRODUCTION TO STATISTICS (24ARVA2401)		Credit : 3
Class	**B.Voc Dairy Production and Technology** Ability Enhancement Course -4	**Semester**	IV
Cognitive Level	**K-1** Understand the origin, significance, and scope of Statistics.		
	K-2 Know the significance of presenting data in the form of tables and diagrams.		
	K-3 Learn computational aspects of basic statistical measures.		
Course Objectives	**The Course aims** • To be familiar with the basic concepts and terminology of statistics. • To understand the importance and application of statistics in different disciplines • To develop skills among the students to carryout analysis using appropriate statistical tools • To develop skill in reading and understanding the results from data analysis • To enable students to be familiar with basic concepts and terms and the uses of statistics in quality control		

UNIT	Content	No. of Hours
I	Introduction to Statistics – Collection, Classification and Tabulation of data – Frequency distribution – Graphical and Diagrammatic representation of data and its uses.	12
II	Descriptive Statistics – Measures of Central Tendency: Mean, Median and Mode, Measures of Dispersion: Range, Standard Deviation, Co-efficient of variation – Simple problems.	13
III	Correlation - Definition, Types of Correlation – Karl Pearson's correlation coefficients, Spearman's Rank Correlation coefficients. Regression - Concept, Definitions – Simple regression equations – fitting of regression equation, Simple Problems.	13
IV	Population and samples – Selection of sample – Random samples – Standard error – Type I Error and Type II Error – Test of Hypothesis - Basic concepts: Types of tests; Z-test, t-Test and Chi-square test of significance.	13

V	Statistical Quality control – Introduction, product and process control, control charts, and control limits and specification limits, Types of control charts: $\bar{X}$ and R chart – P, c and np chart – Simple problems.	**13**
References	• Krishnanswamy,O.R, Methodology of Research in Social science, Himalaya Publishing House, Bombay, 2002. • Verma B.L, Shukla G.D and Srivastava.R.N, Biostatistics – Perspectives in Health Care; Research and Practice, New Delhi: CBS Publishers & Distributors, 1993. • Veer Bala Rastogi, Biostatistics, Medtech publication, (3rd revised Edition), 2017. • Qazi Shoeb Ahmad, Viseme Ismail, Biostatistics, University Science press, new Delhi, (1st Edition), 2008. • Siegel, Sideny, Non-Parametric Statistics for Behavioral Sciences, New Delhi: MCGraw Hill, 2006.	
Text Books	• Gupta. C.B, An Introduction to Statistical Methods, New Delhi: Vikas Publishers, (23rd Ed), 2004. • Gupta. S.P, Statistical Methods, New Delhi: Sultan Chand, 2017. • Goon, A.M., M. K. Gupta and B. Das Gupta, Fundamentals of Statistics- Vol. II., World Press, Ltd, Kolkata. 2016. • Hogg. R.T. and A.T. Craig. A.T, Introduction to mathematical Statistics, (7thEd), 2012. • Rangaswamy, A Textbook of Agricultural Statistics, (3rd Ed), New Age International Publishers, New Delhi, 2020.	
Websites	• https://www.biostat.washington.edu/about/biostatististics • https://www.agrimoon.com/wp-content/uploads/Statistics.pdf • https://fac.ksu.edu.sa/sites/default/files/stat_-book_introduction_to_statistics.pdf	
Course Outcomes	On completion of the course, students should be able to do CO1: Solve problems using appropriate statistical measures CO2: Create and interpret visual representation of statistical data CO3: Acquire knowledge on different types of error and tests CO4: Learn about correlation and Regression and their applications CO5: Prepare different quality control charts such as $\bar{X}$, R, P, np and c chart.	

Semester	**IV**			
Course Code	**24GTPUV1001/24GTPIV1001**			
Course Title	**LET US KNOW GANDHI**			
No. of Credits	2		**Contact Hours per week**	**2**
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	
Category	**NSQF**	General Education Component (GEC)		
	NEP	Value Added Course (VAC) -2		
Course Objective	• To enable students to understand and appreciate the principles and practices of Mahatma Gandhi and their relevance in the contemporary times. • To develop a Pro-active character and positive attitude to follow Gandhi an values and responsibilities in their personal and social life.			

Unit	**Content**
I.	**Gandhiji's Life in Brief**: Early Life of Gandhi – London Learning Phase-South African Phase: Racial Discrimination, Transformation and Satyagraha - Indian Phase: Social reformation and Indian Independence- Martyrdom.
II.	**nding Gandhian Principles**: Eleven Ashram Vows-Truth and Nonviolence, Ends and Means, Right and Duties, Simple Living and High Thinking.
III.	**Applications of Gandhian Principles**: Sarvodaya - Welfare of all, Satyagraha - Peace and Justice, and Training for Nonviolent Action: Shanti Sena as an alternative Defence.
IV.	**Societal Reformation**: Influence of Seven Social Sins - Communal Harmony: Pluralism - Religions and Inter-faith Relations, Removal of Untouchability, Prohibition and Gender Equality- Governance : Decentralization of Power and Panchayati Raj - Economics: Trusteeship, Bread Labour and Self Reliance (Swadesi)
V.	**Gandhian Alternative to Education**: BasicEducation(NaiTalim),-Multi-lingualism-Adult Education,- Education on Health, Sanitation and Hygiene: VillageSanitation, Balanced and Healthy Diet, Nature Cure

References:

Arunachalam: (1985),Gandhi: The Peace Maker, Gandhi Samarak, Nidhi,Madurai.

LouisFischer,(2002),The Essential Gandhi: An Anthology of His Writing son His Life, Work and Ideas, Vintage, New York.

NandaB.R., (1958), Mahatma Gandhi: A Biography, Oxford University Press, NewDelhi.

M.K. Gandhi: (1983), An Autograph or the Story of My Experiments with Truth, Navajivan Publishing House, Ahmadabad.

M.K.Gandhi:(1951), Satyagraha in South Africa: Navajivan Publishing House, Ahmadabad.

	M.K.Gandhi:(1983), Constructive Programme – Its Meaning and Place. Navajivan Publishing House, Ahmadabad. M.K.Gandhi:(1948) Key to Health, Navajivan Publishing House, Ahmadabad. M.K.Gandhi:(1949), Diet and Diet Reforms, Navajivan Publishing House, Ahmadabad. M.K.Gandhi: Basic Education, Navajivan Publishing House, Ahmadabad. M.K.Gandhi:(2004), Village Industries, Navajivan Publishing House, Ahmadabad. M.K.Gandhi:(1962), Hind Swaraj or The Indian Home Rule, Navajivan Publishing House, Ahmadabad. M.K.Gandhi:(2004), Trusteeship, Navajivan Publishing House, Ahmadabad. M.K.Gandhi:(2001), India of my Dreams, Navajivan Publishing House, Ahmadabad. M.K.Gandhi: Self Restraint Vs. Self Indulgence, Navajivan Publishing House, Ahmadabad. R.R.Prabhu & UR Rao. The Mind of Mahatma Gandhi, Navajivan Publishing House.

Semester	**IV**		
Course Code	**24DTVB2401**		
Course Title	**DAIRY PLANT DESIGN AND LAYOUT**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	Revised Course	**Percentage of Revision effected**	30
Category	**NSQF**	General Education Component (GEC)	
	NEP	Minor -3	
Course Objective	• 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 Outcome	• 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	Content
I.	**Introduction:** Type of dairies, 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.
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, fitting the process sections, utility/service sections, offices and workshop.
III.	**Planning of layout:** Arrangement of equipment, milk piping, and material handling in dairies, Common problems, and office layouts- flexibility. Development and presentation of layout, model planning, and use of planning table in developing plot

	plant and detailed layout.
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, rodent control and illumination in dairy plants.
V.	**Drawing of layout:** Measurements in drawing, Design and layout of: Milk collection/chilling centre; Fluid milk plant - Single product dairy (i) Cream, (ii) ice-cream, (iii) butter and composite dairy plant
References:	
Text Books	1. Tuffel Ahmad 1995, Dairy Plant Engineering and Management, KitabMachal Distributers, New Delhi 2. LalatChander, 2009, Dairy plant layout and Design. 3. Shivashaya singh-2013 Dairy Technology- New India publishing agency- INDIA.
Reference Books	1. Sukumar De 1980, Outlines of Dairy Technology. Oxford University Press, New Delhi. 2. Suni.M., Patel .A.G, Bhadania-2016-Dairy plant Design and layout – ICAR- Publications
Web Resources	• www.agrimoon.com

Semester	**IV**			
Course Code	**24DTVS2402**			
Course Title	**DAIRY PLANT MANAGEMENT**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	General Education Component		
	NEP	Minor -4		
Course Objective	• 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 Outcome	• 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	Content
I.	**Product Design:** Product design process-product screening-Break even analysis-preliminary design testing-final design-design manufacture-Optimization of Product Composition - product design decisions-Product and service strategy-product life cycle-concurrent engineering-remanufacturing
II.	**Process Design:** Types process-continuum process types-Process flow analysis-process performance metrics-Linkage product design and process selection-competitive priorities –facility layout- degree of vertical integration
III.	**Managing Productivity:** Introduction-Managing Productivity - Conception and Misconception Productivity - Factor Affecting Productivity – Productivity Dairy

	Industry - Optimization Resources Sizing of Process Equipment- Plant Automation - Product Mix Models
IV.	**Milk Losses:** Objectives-Introduction -Milk Losses in Dairy Plants -Present scenario of Milk Handling Losses -Losses During Various Stages of Processing –Identification Milk Losses -Factors Responsible for Milk Losses- Monitoring the Milk Losses - Controlling of Milk Solids Losses - Fixing Frequency of Equipment Cleaning - Regular Monitoring - Continual Improvement Techniques -Check List for Independent Monitoring (Audit for Milk Losses) and Self Appraisal for Taking Corrective Measure
V.	**Human Resources (Man Power Planning For Dairy/Plant):**Definition-Human Resource Planning-Functional Requirements of Plant – Organization Structure - Factors Affecting Human Resource Deployment - Manpower Quality Aspects - Determining Manpower Strength - Manpower Planning for Shift -Optimizing Human Resource - Leadership - Motivation Concepts - Skill Enhancement - Management of Resistance to Change - Effective Communication - Effective Coordination.
References:	
Text Books	1. Sontakey, D.R. Productivity (1995), CBWE Publication, Nagpur-10 2. Tuffel Ahmad 1995, Dairy Plant Engineering and Management, KitabMachal Distributers, New Delhi. 3. Abbass F, Alkhafaji, 1995, Competitive Global Management Principles and Strategies, New Age International (P) Limited, Dariya Ganj, New Delhi-110002. 4. Sur, Mary, 1996, Wrokers participation in management, CBWE Publication, Nagpur10.
Reference Books	1. Katre, B.C. and Prasad, Sitaram,2000, Improved management on operational performance in food industry with milk processing plant as a model, Indian Food Industry, 19(2):107-117 2. David, J. 2007. Contemporary Trends in Dairy Plant Management. Gyan Books Pvt. Ltd., Delhi
Web Resources	• http://ecoursesonline.iasri.res.in/mod/page/view.php?id=5691 • https://agrimoon.com/book/

Semester	**IV**			
Course Code	**24DTVC2403**			
Course Title	**DAIRY EQUIPMENT OPERATION AND MAINTENANCE**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	Revised Course		**Percentage of Revision effected**	40
Category	**NSQF**	Skill Development Component		
	NEP	Major -8		
Course Objective	• 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 Outcome	• 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	Content
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.
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.
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.
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.
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. Tuffel Ahmad 1995, Dairy Plant Engineering and Management, KitabMachal Distributers, New Delhi 2. Ramasamy D, 1999. Dairy Technologists Hand Book, International Book Distributing Co, Lucknow 3. Sukumar De 1980, Outlines of Dairy Technology. Oxford University Press, New Delhi.
Reference 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.
Web Resources	• http://ecoursesonline.iasri.res.in/course/view

Semester	**IV**		
Course Code	**24DTVC2404**		
Course Title	**TECHNOLOGY OF FAT AND PROTEIN RICH MILK PRODUCTS**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	**Revised Course**	**Percentage of Revision effected**	40
Category	**NSQF**	Skill Development Component	
	NEP	Major -9	
Course Objective	• 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 Outcome	• Students will learn the preparation of fat rich milk products viz., cream , butter and ghee manufacture. • Students get to know about preparation of protein rich dairy product viz cheese and their importance. • Students will gain knowledge on storage, merits and demerits of fat and protein rich products.		

Unit	Content
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.
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.
III.	**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.
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.
V.	**Cheese varieties:** definition, composition, standards, types of cheese, 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. 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.
Reference Books	1. Rangappa, K.S. and Acharya, K.T. 1974. Indian Dairy Products. Asia Publishing House, New Delhi. 2. Mathur MP, Roy DD &Dinakar P.1999. Textbook of Dairy Chemistry. ICAR. 3. Anantakrishnan, C.P. and Srinivasan, M.R.1964. Milk Products of India. ICAR Publications, New Delhi.
Web Resources	• http://ecoursesonline.iasri.res.in/course/index.php?categoryid=9 • http://www.strategyr.com/Cheese_Market_Report.asp • https://agrimoon.com/book/

Semester	**IV**		
Course Code	**24DTVC2405**		
Course Title	**DAIRY PLANT ENGINEERING AND MANAGEMENT – PRACTICAL**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	**New Course**	**Percentage of Revision effected**	-
Category	**NSQF**	Skill Development Component	
	NEP	Major -10	
Course Objective	• 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.		

Practicals

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**			
Course Code	**24DTVC2406**			
Course Title	**FAT AND PROTEIN RICH MILK PRODUCTS – PRACTICAL**			
No. of Credits	3		**Contact Hours per week**	3
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	25
Category	**NSQF**	Skill Development Component		
	NEP	Major -11		

Practicals

1. Preparation of cream
2. Estimation of chemical composition of cream
3. Preparation of butter
4. Estimation of chemical composition of butter
5. Preparation of butteroil and ghee
6. Estimation of chemical composition of butteroil and ghee
7. Study of rennet
8. Preparation of Channa
9. Observation of milk coagulation
10. Preparation of Cheese
11. Estimation of chemical composition of cheese
12. Sensory evaluation, Judging and packaging of following products;
    a. Milk
    b. Cream
    c. Butter
    d. Ghee
    e. Cheese and related products

Semester	**IV**			
Course Code	**24DTVE2407**			
Course Title	**DAIRY PLANT: QUALITY CONTROL (INTERNSHIP-4)**			
No. of Credits	6		**Contact Hours per week**	6
New / Revised Course	Revised Course		**Percentage of Revision effected**	20
Category	**NSQF**	Skill Development Component		
	NEP	Field Study / Community Engagement		
Learning Outcome	• Students have to undergo Inplant training at an established dairy unit and should learn about all the following procedure.			

Work Plan

Reception

d. Record milk inlet
    i. Record the details of milk route and cans.
    ii. Weighing and fat percentage of inlet milk.
e. Laboratory
    i. confirm the quality of received milk
    ii. analysis of proximate composition
f. cleaning and sanitation
    i. Preparation of cleaning solution.
    ii. Proper usage of cleaning and sanitizing solution.

5. Documentation
    a. Record all the reading at various dairy sections
        viii. Reception section
        ix. Processing section
        x. Packaging section
        xi. Waste management section
        xii. Transportation and storage.
        xiii. Product preparation

xiv. Ingredient section - Prepare balance sheet and maintain the record.

b. Document all the recorded values and management of records.

6. 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.
7. 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
8. Waste management
    h. Analysis the amount of waste produced in plant.
    i. Prepare procedure for management of waste.
    j. Learn about ETP Detection of heavy metals in milk.
    k. Detection of pesticide residue in milk.
    l. Detection of antibiotics.
    m. Estimation of BOD and COD.
    n. Conventional and modern treatment methods of dairy waste.
9. 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.

SEMESTER – V

Semester	**V**		
Course Code	**24DTVB3501**		
Course Title	**DAIRY EXTENSION AND ENTREPRENEURSHIP**		
No. of Credits	4	**Contact Hours per week**	4
New / Revised Course	Revised Course	**Percentage of Revision effected**	30
Category	**NSQF**	General Education Component (GEC)	
	NEP	Minor -5	

Course Objective	• 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 Outcome	• 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	**Content**
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.
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.
III.	**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.
IV.	**Introduction to Entrepreneurship;** Definition – concept – industrial small entrepreneurship- meaning-important-signification and scope- characteristics of entrepreneur-Factors influence rural entrepreneurial development
V.	**Entrepreneurial Development:** Approaches to Entrepreneurship Development – EDP – Issues – Entrepreneurial Training – Methods and Institutions offers Entrepreneurial Training – Market Survey – Model Project Report.
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.
Reference 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.

Semester	**V**			
Course Code	**24DTVB3502**			
Course Title	**PACKAGING AND JUDGING OF MILK PRODUCTS**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	General Education Component (GEC)		
	NEP	Minor -6		

Course Objective	• 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 Outcome	• 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	**Content**
I.	**Packaging materials** –Define- types of packaging materials – aluminum foils/containers, glass, LDPE, HDPE, PET, polystyrene, polypropylene, PVC, Multi-layer sheet/film -disposal packaging materials – dump filling - incineration – reuse – recycling packaging materials. Packaging – function – use of different material in milk and milk products.
II.	**Coding and Labeling:** Packaging and labeling FSSAI regulations 2011-Packaging requirements for milk and milk products-Bottling-filling-wrapping-sealing- after packaging- Labeling requirements for milk and milk products- Pre-packaged foods-Nutritional information-Declaration-Veg-Non-Veg-Food Additives- Manufacturer details-Specific requirements.

III.	**Packaging techniques**– Packaging technique like vacuum packaging, modified atmospheric packaging (MAP) ,oxygen absorbers/scavengers, poly clip system – zip lock method, aseptic packaging – definition and types. Compatibility and toxicity of packaging materials.
IV.	**Tests for Packaging material**– Types of tests for packaging materials- Odour test-width test - Thickness tests - INK test-Impact resistance test-Leak test-Drop test
V.	**Judging and grading –** defects in milk, score card and its uses – judging and grading of milk and milk products.

References:

Text Books	1. HC.Patel & Hiralmodha and M.Rangantham - Packaging of Dairy products- ICAR-2017 2. Eeckless, C.H., Combs,W.B. and Macy, H., 1955, Milk and Milk Products, Tata McGraw-Hill Publishing Company Ltd., New Delhi. 3. Sukumar, De., 1980, Outlines of Dairy Technology, Oxford University Press, New Delhi. 4. Marcel Dekker. Coles R, McDowell D & Kirwan M.J. 2003.Food Packaging Technology. Oxford Blackwell 5. Leonard Hill. Gordon L Robertson. 2006. Food Packaging: Principles and Practice. 2nd Ed. CRC Press
Reference Books	1. Blackie.Raija A. 2006. Novel Food Packaging. Woodland Publ. Co.
Web Resources	https://agrimoon.com https://www.tetrapak.com https://gcwgandhinagar.com

Semester	**V**			
Course Code	**24DTVC3503**			
Course Title	**QUALITY MONITORING IN DAIRY INDUSTRY**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	New Course		**Percentage of Revision effected**	-
Category	**NSQF**	General Education Component (GEC)		
	NEP	Major -12		
Course Objective	• To provide an opportunity to learn quality monitoring to dairy industry • To gain knowledge about the self-life strategies of milk products with 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 quality standards for dairy products.			

Unit	Content
I.	**Microbial risk profiles**: Introduction – concepts – scope and purposes – grouping of dairy commodities - Risk Ranking of Dairy Products - Risk Management Issues and Control Strategies for Dairy Products.
II.	**Microbiological Criteria and sampling guidelines:** Components of a Microbiological Criterion - Types of Microbiological Criteria - Microbiological Criteria for Acceptance or Rejection of Sample Lots.
III.	**Microbiological Standards:** Sampling Plans and FSSAI Microbiological Quality and Standards for Milk and Milk Products - Sample Size, Storage and Transport Standards and Reference Methods of Testing. Biosafety concepts in handling dairy pathogens.
IV.	**Chemical quality assurance:** Concept and importance of chemical quality control in dairy industry – objectives and importance of quality assurance - benefits - role of quality assurance department - Necessity of HACCP in dairy industry

V.	**Prediction of shelf life behavior:** Introduction - Shelf Life - Declaration about shelf life of milk and milk products food – direct and indirect method for determination of shelf life of milk and milk products.
References:	
Text Books	1. Fox PF. 1985. Developments in Dairy Chemistry. Vol. III. Applied Science Publ. 2. Law BA. 1997. Microbiology and Biochemistry of Cheese and Fermented Milks. 2nd Ed. Blackie Academic and Professional, Chapman &Hall.
Reference Books	1. Mathur MP, Roy DD &Dinakar P.1999. Textbook of Dairy Chemistry. ICAR. 2. Walstra P &Jenness R. 1984. Dairy Chemistry and Physics. John Wiley & Sons. 3. Ramasamy (1999) Dairy Technologist's Hand Book, International Book Distributing Co, Lucknow
Web Resources	1. Srivastava.L. (2002)., Hand Book of Milk Microbiology, Daya Publishing House, Delhi. 1. Yadav, J.S Sunita Grover and V.K. Batish (1993), A Comprehensive Dairy Microbiology, Metropolitan Book Co. Pvt. Ltd., New Delhi.
	https://agrimoon.com

Semester	**V**		
Course Code	**24DTVC3504**		
Course Title	**TECHNOLOGY OF CONCENTRATED AND DRIED MILK PRODUCTS**		
No. of Credits	4	**Contact Hours per week**	4
New / Revised Course	Revised Course	**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component	
	NEP	Major -13	
Course Objective	• To impart knowledge regarding concentrated and dried milk products. • To gain hands on training on production on concentrated and dried milk products.		
Learning Outcome	• Students will gain knowledge on various process flows for preparation of variety of condensed dairy products. • This course provide knowledge on physiochemical properties of concentrated and dried milk products. • Students will get to know about the technical problems involved in production of dairy products		

Unit	Content
I.	**Concentrated milk:** History, status and scope of condensed and evaporated milk in India and Abroad. Types of concentrated milk - legal standards – grading and quality of raw milk and pretreatment for concentrated milk. Freeze and membrane concentration.
II.	**Condensed and Evaporated milk:** Definition - composition - standards – physiochemical properties - method of manufacture – pilot sterilization test - defects and control measures.
III.	**Production Techniques of dried milks:** Drum drying: freeze, vaccum and foam

	drying. Spray drying: air heating, atomization, separation and two stages drying. Fluidized bed drying. Instantization: factors affecting instantizing – purpose.
IV.	**Method of manufacture of Whole milk powder and Skimmed milk powder:** definition – composition - standards – physiochemical properties – method of manufacture – keeping quality of milk powder - defects and control measures.
V.	**Dried milk products:** Composition and method of production of infant milk powder - malt powder – ice cream mix powder - gulabjamun powder - whey powder - casein powder - milk protein concentrate powder (MPC).
References:	
Text Books	1. Sukumar De (1980) Outlines of Dairy Technology, Oxford University Press, New Delhi. 2. Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee (2002)., Technology of Indian Milk Products, Dairy India year book 2007. 3. Eeckless C.H, W.B Combs and H.Mecy (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd. New Delhi. 4. Walstra, P., Wouters, J. T. M. and Geurts, T. J. 2006. Dairy Science and Technology. 2nd ed. Pub. Taylor & Francis Group, LLC, Wageningen, The Netherlands.
Reference Books	1. Robinson, R. K., ed. 1994. Modern Dairy Technology. Vol. 1. Advances in Milk Products. Vol. 2. Advances in Milk Processing . Elsevier, NY. 2. Goff, D. 1995. Concentrated and Dried Dairy Products. Dairy Science and Technology Education Series. University of Guelph, Canada.
Web Resources	• http://ecoursesonline.iasri.res.in/course/index.php?categoryid=9 • http://en.wikipedia.org/wiki/Powdered_milk • https://agrimoon.com/book/

Semester	**V**			
Course Code	**24DTVC3505**			
Course Title	**TECHNOLOGY OF TRADITIONAL MILK PRODUCTS**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Major -14		
Course Objective	• To project the significance and status of traditional dairy products in Indian dairy industry. • To gain and understanding of manufacturing methods of traditional dairy products			
Learning Outcome	• 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	Content
I.	**Indigenous dairy products:** definition – present status and market potential of traditional dairy products – globalization of traditional dairy products – classification of traditional milk products.
II.	**Heat desiccated milk products:** Khoa – Classification- methods of manufacture – Factors affecting yield of khoa –yield and cost analysis of khoa. Confectionaries made from khoa –burfi, peda, milkcake, kalakand, gulabjamun, rabri, malai, khurchan, basundhi – composition – manufacturing practices – Nutritive value
III.	**Heat acid coagulated product:** Paneer: definition- mechanization of paneer manufacturing - paneer based products – storage and packaging and preservation methods – Nutritive value of paneer.

IV.	**Channa based products:** Chhana – Product description, methods of manufacture, packaging and preservation. Chhana based sweets – Rasogolla, Sandesh, Rasamalai, and Chhanapodo - their manufacturing practices, compositional profile and mechanization of manufacturing process including packaging
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 (2^{nd}ed). 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.
Reference Books	1. Dharam Pal and Narender Raju, P. (Eds). (2006). Developments in Traditional Dairy Products, Lecture Compendium of the 21^{st} Short Course, CAS in Dairy Technology, NDRI, Karnal. 2. Pal, D. (1997). Technology of the manufacture of *rabri* and *basundi*. In Advances in Traditional Dairy Products. Short course, CAS in Dairy Technology, NDRI Deemed University, Karnal.
Web Resources	• http://ecoursesonline.iasri.res.in/mod/page/view.php?id=6264 • https://agrimoon.com/book/

Semester	**V**			
Course Code	**24DTVC3506**			
Course Title	**TRADITIONAL MILK PRODUCTS – PRACTICAL**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Major -15		

Practicals

1. Preparation of Khoa and Peda
2. Preparation of Burfi
3. Preparation of Gulabjamun
4. Preparation of Channa based products: Paneer and Rasogolla
5. 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
6. Preparation of Fermented products from whey.
7. Preparation of Beverages from whey.
8. Preparation of Basundhi.
9. Preparation of Flavored Buttermilk
10. Preparation of Probiotic dairy product

Semester	**V**		
Course Code	**24DTVE3507**		
Course Title	**DAIRY PRODUCT DEVELOPMENT (EXPERIENTIAL LEARNING)**		
No. of Credits	6	**Contact Hours per week**	6
New / Revised Course	**Revised Course**	**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component	
	NEP	Field Study / Community Engagement	
Course Objective	• Students have to undergo experiential training at university dairy plant • 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

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

D) Packaging

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

E) Observe various marketing strategies of dairy products.

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

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. 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**		
Course Code	**24DTVB3601**		
Course Title	**WASTE DISPOSAL AND EFFELUENT TREATMENT**		
No. of Credits	4	**Contact Hours per week**	4
New / Revised Course	**Revised Course**	**Percentage of Revision effected**	25
Category	**NSQF**	General Education Component (GEC)	
	NEP	Minor -7	
Course Objective	• 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	**Content**
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 of genetically engineered microorganisms in environment; environmental laws.
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.
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.

IV.	Treatment and disposal of dairy waste water: Disposal methods – Sources of effluents and their recycling in dairy industry – Biogas formation, Panchakaviya. Zero discharge.
V.	Definition, standard, determination procedure of BOD and COD. Waste water discharge standards.
References:	
Text Books	1. Kumar, H.D. 1998. Environmental Pollution and Waste Management. MD Publ. Pvt. Ltd., New Delhi. 2. Maliwal, G.L. 2007. Hand book of Environmental Management. Agrotech Publ. Academy, India. 3. Kamayoprs J.S 2010 "central pollution control board" published by sri mathi mita
Reference Books	1. Jeffer pierce 1997 "environment pollution and control" published by butterworth – Heinemann.
Web Resources	• http://ecoursesonline.iasri.res.in/course/view.php?id=115 • https://agrimoon.com/book/

Semester	**VI**			
Course Code	**24DTVB3602**			
Course Title	**MILK BY PRODUCTS UTILIZATION**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	Revised Course		**Percentage of Revision effected**	30
Category	**NSQF**	General Education Component (GEC)		
	NEP	Minor -8		

Course Objective	• To provide the knowledge about by products from animal and milk • To gain hands on training to utilization of dairy by products.
Learning Outcome	• 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	**Content**
I.	**Dairy By-products** – definition, classification, status, availability and utilization of food by products in India and Abroad.-Benefits of by-product.
II.	**Dairy 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.
III.	**Dairy By Product – II:** Whey - composition - types – specification - manufacturing techniques - Fermented products from whey - Beverages from whey - Condensed whey – WPC- Nutritional importance.
IV.	**Dairy 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.
V.	**Dairy 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.
Reference Books	Sukumar De (1980) Outlines of Dairy Technology, Oxford University Press, New Delhi.
Web Resources	https://agrimoon.com/book/

Semester	**VI**		
Course Code	**24DTVB3603**		
Course Title	**DAIRY ECONOMICS AND MARKETING**		
No. of Credits	4	**Contact Hours per week**	4
New / Revised Course	Revised Course	**Percentage of Revision effected**	30
Category	**NSQF**	General Education Component (GEC)	
	NEP	Minor -9	
Course Objective	• 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 Outcome	• 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	Content
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.
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.
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.
IV.	**Marketing Management Functions**: Product planning – Sales organizations, market research, physical distribution – Services of different market functionaries – Advertisings.
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.
Reference Books	1. R.S.N.PillaiBagavathi, 2002, Modern Marketing Principles and Practices, S.Chand& Company Ltd. New Delhi 2. S.S.Johl and T.R.Happer, 1973. Fundamentals of Farm Business Management. Kalyani Publishers.
Web Resources	https://agrimoon.com/book/

Semester	**VI**			
Course Code	**24DTVC3604**			
Course Title	**TECHNOLOGY OF CULTURED AND FROZEN MILK PRODUCTS**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component		
	NEP	Major -16		
Course Objective	• To impart knowledge regarding cultured and frozen milk products. • To gain hands on training on production on cultured and frozen milk products.			
Learning Outcome	• Students will gain knowledge on various process flows for preparation of variety of cultured and frozen milk products. • This course provide knowledge on physiochemical properties of products including curd, yoghurt and ice-cream products. • Students will get to know about the technical problems involved in production of dairy products.			

Unit	Content
I.	**Starter culture:** Starter culture: Definition – classification - propagation and preservation methods - factors affecting activity of starter cultures – characteristics of good starter culture. Probiotic, prebiotic and symbiotic: definition and its functionalities.
II.	**Fermentation Process:** Fermentation Process Strategies - Types of Fermentation: Submerged, Solid and Surface. Type of Fermentors - Stages in a fermentation process. **Curd & Yoghurt**: Definition, composition - specifications - method of manufacture and its production techniques – defects and control measures. Therapeutic benefits of fermented milk products.
III.	**Ingredients for ice cream:** Status of ice cream industry - Classification of frozen dairy products - Ice Cream: composition, specifications: BIS and PFA standards. Ice Cream

	ingredients: stabilizers and emulsifiers, flavouring and colouring materials and its action in ice cream.
IV.	**Method of manufacture of Ice cream & Kulfi**: Role milk of the constituents in ice cream Calculation of mixes - properties of ice cream mix - production techniques of ice cream - freezing of ice cream mix - defects and control measures - control of over run. **Kulfi**: definition- composition – standards - method of manufacture.
V.	**Fermented milk products:** Buttermilk. cultured buttermilk, bulgarian butter milk, acidophilus milk, lassi, kefir, kumiss, shrikhand, mistidahi: definition composition – method of manufacture. F**rozen desserts:** sherbets, ices, soft serve. Low calorie ice cream, Probiotic ice cream, Diabetic and Dietetic ice cream: composition – method of manufacture - nutritive values.
References:	
Text Books	1. Sukumar De (1980) Outlines of Dairy Technology, Oxford University Press, New Delhi. 2. Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee (2002)., Technology of Indian Milk Products, Dairy India year book 2007. 3. Eeckless C.H, W.B Combs and H.Mecy (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd. New Delhi. 4. Walstra, P., Wouters, J. T. M. and Geurts, T. J. 2006. Dairy Science and Technology. 2nd ed. Pub. Taylor & Francis Group, LLC, Wageningen, The Netherlands.
Reference Books	1. Arbuckle, W.S. 1991. Ice Cream. AVI Publ., Co. Inc., West Port, Connecticut 2. NDRI. 1998. Advances in Ice Cream and Frozen Desserts. Lecture compendium, Sixth short course, Dec15, 1998- Jan 4, 1999. NDRI, Karnal. 3. Robinson, R. K., ed. 1994. Modern Dairy Technology. Vol. 1. Advances in Milk Products. Vol. 2. Advances in Milk Processing . Elsevier, NY.
Web Resources	• http://ecoursesonline.iasri.res.in/course/index.php?categoryid=9 • http://en.wikipedia.org/wiki/Powdered_milk • https://agrimoon.com/book/

Semester	**VI**			
Course Code	**24DTVC3605**			
Course Title	**CULTURED FROZEN AND DRIED MILK PRODUCTS - PRACTICAL**			
No. of Credits	4		**Contact Hours per week**	
New / Revised Course	**Revised Course**		**Percentage of Revision effected**	
Category	**NSQF**	Skill Development Component		
	NEP	Major -17		
Learning Outcome				

Practicals

1. Propagation of starter culture
2. Preparation of Curd
3. Preparation of Yoghurt
4. Estimation of chemical composition of Curd and Yoghurt.
5. Preparation of Acidophilus milk
6. Preparation of Kumis
7. Preparation of Lassi
8. Preparation of Fermented products from whey.
9. Preparation of Ice cream
    a. Softy ice cream
    b. Probiotic ice cream
    c. Low fat ice cream
    d. Dietetic ice cream
    e. Sherbets and ice
    f. Ice cream shakes
10. Estimation of chemical composition of ice cream
11. Preparation of condensed milk.
12. Preparation of evaporated milk.
13. Estimation of chemical composition of dried milk products

<table>
<tr><td>Semester</td><td colspan="4">VI</td></tr>
<tr><td>Course Code</td><td colspan="4">24DTVS3606</td></tr>
<tr><td>Course Title</td><td colspan="4">DAIRY NOVELTIES AND MODELING – MINI PROJECT</td></tr>
<tr><td>No. of Credits</td><td>4</td><td colspan="2">Contact Hours per week</td><td>4</td></tr>
<tr><td>New / Revised Course</td><td colspan="2">Revised Course</td><td colspan="2">Percentage of Revision effected</td></tr>
<tr><td rowspan="2">Category</td><td>NSQF</td><td colspan="3">Skill Development Component</td></tr>
<tr><td>NEP</td><td colspan="3">Skill Enhancement Course -6</td></tr>
<tr><td>Course Objective</td><td colspan="4">• To gain knowledge on the latest concept in area related to dairy technology.</td></tr>
<tr><td>Learning Outcome</td><td colspan="4">• 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.</td></tr>
<tr><td colspan="5">Work Plan</td></tr>
<tr><td colspan="5">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 technology. At the completion of the project the student will submit a mini project report. The evaluation will be based on the project report and a viva voce examination on the project.</td></tr>
</table>

Semester	**VI**		
Course Code	**24DTVE3607**		
Course Title	**DAIRY PLANT: OVERALL DAIRY INDUSTRY (INTERNSHIP-6)**		
No. of Credits	6	**Contact Hours per week**	6
New / Revised Course	**Revised Course**	**Percentage of Revision effected**	30
Category	**NSQF**	Skill Development Component	
	NEP	Field Study	
Course Objective	• Students have to undergo Inplant training at an established dairy unit and should learn about all the following procedure.		

Work Plan

Reception

g. Record milk inlet
   i. Record the details of milk route and cans.
   ii. Weighing and fat percentage of inlet milk.

h. Laboratory
   i. confirm the quality of received milk
   ii. analysis of proximate composition

i. cleaning and sanitation
   i. Preparation of cleaning solution.
   ii. Proper usage of cleaning and sanitizing solution.

10. 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.

11. 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.

12. 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

13. Waste management

a. Analysis the amount of waste produced in plant.

14. 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.

15. 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.

SEMESTER – VII

Course Code & Title	(24ARVS4101) RESEARCH METHODS		Credit : 4
Class	B.Voc Dairy Production and Technology (Skill Enhancement Course -7)	Semester	VII
Cognitive Level	**K-1** Understanding the basics of research methodology		
	K-2 Constructing tools for data collection in research		
	K-3 Developing skill in preparing scientific research report		
Course Objectives	**The Course aims to** • identify and formulate a problem for research. • prepare suitable research design to study the research problem to be formulated • familiar the techniques for effective data collection and constructing a scale • prepare research report in a professional manner.		

UNIT	Content	No. of Hours
I	Research: Definition, Characteristics and Functions of Research. Scientific method. Types of research: Pure, Applied and Action Research, Qualitative and Quantitative studies. Research Skills and Ethics, Significance of Ethical Committee – Criteria for good research.	12
II	Steps in Research: Research Process, Selection and Formulation of Research Problem, Statement of the Problem and Definition of concepts, Objectives. Review of Literature, Reference Management Software. Conceptual Framework, Types of Variables – Hypothesis: types, characteristics and functions.	13
III	Preparation of Research Design: Exploratory, Descriptive, Diagnostic and Experimental designs - types. Methods of Research: Multidisciplinary, Interdisciplinary and Transdisciplinary studies, Mixed methods. Participatory research: RRA, PRA and PLA.	13
IV	Sources and types of Data Collection: conduct of Interview, Observation, Schedule and Questionnaire. Sociometry, Psychological test and Projective techniques, Content analysis, Survey, Case study - Scaling Techniques – Online	13

	research methods – Pre- test, Test of reliability and validity.	
V	Research Report: Format - types of reports – Citation styles, Reference Materials, Bibliography, Webliography, Footnotes, Glossary, Index and Appendix. Preparation of Research Proposal, Plagiarism – Impact factor - dissemination of research findings – publication process.	**13**
References	• Alan Bryman, Social research Methods, Oxford Publication, 2018. • Bandarkar and Wilkinson, Methods and techniques of Social Research**,** Bombay: Himalaya Publishing Co, 2010. • Goode and Hatt, Methods in Social Research, New Delhi: McGraw Hill, 2002. • Kothari.C.R, Research Methodology, New Delhi: VishvaPrakashan, 2001. • Lawrence Neuman.W, Social Research Methods: Qualitative and Quantitative Approaches, Pearson publishers, Chennai, (7th Ed), 2014.	
Text Books	• Ranjith Kumar, Research Methodology A Step-By-Step Guide for Beginners, Singapore: Sage Publications Aisa- Pacific Pvt., Ltd, 2014. • Simon, Schuster, Methods of Social Research, Kenneth Bailey, 4th Edition, 2008 • Tony Brown and Liz Jones, Action Research and Postmodernism, Buckingam: Open University Press, 2001 • Tony Greenfield and Sue Greener, Research Methods for Post Graduates, John Wiley and Sons Ltd, 2016. • Vijayalakshmi.G. and Sivapragasam.C, Research Methods: Tips and Techniques, Chennai: MJP Publishers, 2009.	
Websites	• https://www.coursera.org/browse/physical-science-and-engineering/research-methods • https://docs.wixstatic.com/ugd/87dd0d_ff020fea747047d19cb81d60e371ffaa.pdf?index=true • https://www.ncrm.ac.uk/ • https://www.scribbr.com/category/methodology/ • https://www.liberty.edu/online/courses/CJUS745	
Course Outcomes	On completion of the course, students should be able to CO1: Develop expertise and skills to undertake independent research CO2: Construct research tools CO3: Understand research skills and ethics related issues CO4: Apply of statistical tools from application perspective CO5: Prepare research article and project report	

Basket – I

Specialization: Dairy Processing Technology

Semester	**VII**			
Course Code	**24DTVC4701**			
Course Title	**ADVANCES IN DAIRY PROCESSING**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	**New Course**		**Percentage of Revision effected**	-
Category	**NSQF**	General Education Component		
	NEP	Major -18		
Course Objective	• To provide in-depth knowledge in basic concepts in dairy processing. • To understand the importance and application of advanced dairy processing			
Learning Outcome	• Students will gain knowledge on advance processing in dairy industry. • Students will get to know about the advances in theoretical and practical aspects of food and dairy processing.			

Unit	Content
I.	**Status of dairy Industry:** Introduction – scope of milk processing industry in India and abroad - prospects and constraints in development of Indian dairy industry. Status, availability and utilization of dairy by-products in India and Abroad.
II.	**Advances in milk processing technology- I:** Non thermal process / Membrane technology, Nanotechnology, Microencapsulation process and Carbonation process. Principles and equipment for bactofugation, bactotherm processes, microfluidization of milk - effects and applications in dairy industry.
III.	**Advances in milk processing technology - II:** Dehydration: advances in drying of milk and milk products; Freeze concentration, freeze drying - physicochemical changes, microbiological and textural properties; hurdle technology and its application in different milk products.
IV.	**Advances in preservation process:** Advances in preservation of raw milk. Use of bio-protective factors for preservation of raw milk: effects on physicochemical,

	microbial and nutritional properties of milk and milk products.
V.	**Advances in cleaning process:** Current trends in cleaning and sanitization of dairy equipment: biological; detergents; Automation; Ultrasonic techniques in cleaning; bio-detergents, development of sanitizers- heat; chemical; radiation, mechanism of fouling and soil removal; Bio-films, assessing the effectiveness of cleaning and sanitization of dairy products.
References:	
Text Books	1. Burton H. 1998. Ultra-high Temperature Processing of Milk and Milk Products. Elsevier. 2. Fellow P. 1988. Food Processing Technology. Elliss Horwood Ltd. 3. Gould GW. 1995. New Methods of Food Preservation. Blackie.
Reference Books	1. Smit G. 2003. Dairy Processing – Improving Quality. CRC-Woodhead Publ. 2. Walstra P, Geurts TJ, Noomen A, Jellema A & Van Boekel MAJS. 1999. Dairy Technology – Principles of Milk Properties and Processes. Marcel Dekker.
Web Resources	www.agrimoon.com

Semester	**VII**			
Course Code	**24DTVC4702**			
Course Title	**FUNCTIONAL DAIRY PRODUCTS**			
No. of Credits	4		**Contact Hours per week**	
New / Revised Course	**New Course**		**Percentage of Revision effected**	
Category	**NSQF**	General Education Component		
	NEP	Major -19		
Course Objective	• To impart the knowledge of functional ingredients, nutraceuticals and their utilization in development of new food products including health foods, functional foods and specialty foods.			
Learning Outcome	Upon completion of the course, the students will be able to: • be familiar with the basic concepts and terminology of functional foods; • learn the functionality and therapeutic benefits. • develop skill in nutritional calculation • able to develop new functional dairy product			

Unit	Content
I.	**Value addition:** Importance of value addition in milk and milk products. Global trends and market potential for functional milk products.
II.	**Functional foods:** Definition, role in promoting human health. Nutraceuticals: Definition, classification based on sources of nutraceuticals, Concept of new product development, prospective nutraceuticals for fortification of dairy foods. Advances in different types of functional dairy products.
III.	**Food fortification:** Techniques for fortifying dairy foods with minerals and vitamins. High protein foods. Technological aspects of reduced calorie foods: alternatives for calorie reduction, low calorie sweeteners, bulking agents and their application, fat replacers and their utilization in low calorie dairy foods. Bio-flavours and flavour enhancers.

IV.	**Bioactive components:** Casein, lactose, whey proteins, immunoglobulin, lactoferrin, milk minerals, prebiotics, probiotics and synbiotics. Physio-chemical properties and role of milk constituents.
V.	**Utilization of non dairy ingredients in milk products:** Utilization of cereal, pulses and legume, fruits and vegetable – roots and tubers - sea sources - herbs with special reference to milk and milk products – scope - merits and demerits. Utilization of agro and food wastes.
References:	
Text Books	1. Chadwick R. 2003. Functional Foods. Springer. 2. Gibson G & William C. 2000. Functional Foods. CRC Press. 3. Mitchell JR & Ledward DA. 1986. Functional Properties of Food Macromolecules. Elsevier. 4. Mudambi SR & Rajagopla MV. 1981. Fundamentals of Foods and Nutrition.
Reference Books	1. Pomeranz Y. 1991. Functional Properties of Food Components. Academic Press. 2. Saltmarch M & Butriss J. (Ed.). 2000. Functional Foods II: Claims and Evidence. Royal Society of Chemistry, London. 3. Shi J, Mazza G & Maguer M Le. 2002. Functional Foods: Biochemical and Processing Aspects. CRC Press.
Web Resources	www.agrimoon.com

Semester	**VII**			
Course Code	**24DTVC4703**			
Course Title	**ADVANCED DAIRY PROCESSING - PRACTICAL**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	**New Course**		**Percentage of Revision effected**	-
Category	**NSQF**	Skill Development Component		
	NEP	Major -20		

Practicals

1. Determination of acidity and pH of various dairy products
2. Observation of bactofugation process
3. Determination of LP system of raw milk
4. Determination of chemical preservatives
5. Determination of water activity of milk products
6. Assessing of functional properties of various dairy products
7. Determination of degree of browning-chemical/physical methods
8. Freeze drying of milk/milk products
9. Textural properties of milk products
10. Cleaning efficiency in dairy equipment
11. Visit to a UHT processing plant
12. Visit to a membrane processing plant

Semester	**VII**			
Course Code	**24DTVC4704**			
Course Title	**FUNCTIONAL DAIRY PRODUCTS – PRACTICAL**			
No. of Credits	4		**Contact Hours per week**	
New / Revised Course	**New Course**		**Percentage of Revision effected**	
Category	**NSQF**	Skill Development Component		
	NEP	Major -21		

Practicals

1. Determination of protein by digestion, titration (Khjedal) method in milk products
2. Determination of fat by oil extraction (soxlet) method in milk products
3. Determination of fibre by acid wash (Fibroplus) method in milk products
4. Manufacture of fiber enriched milk beverage
5. Manufacture of low calorie burfi
6. Manufacture of low calorie ice cream
7. Preparation of flavoured milk using natural/artificial sweeteners
8. Development of malted milk food and weaning food
9. Application of lactases for lactose free dairy products
10. Determination of prebiotic potential in fermented milk products
11. Preparation of synbiotics dairy foods
12. Preparation of sports beverage
13. Preparation of herbal dairy drinks
14. Preparation of high protein products

Basket –II

Specialization : Dairy Quality Management

Semester	**VII**			
Course Code	**24DTVC4705**			
Course Title	**CHEMISTRY OF MILK PRODUCTS**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	**New Course**		**Percentage of Revision effected**	-
Category	**NSQF**	General Education Component		
	NEP	Major -18		
Course Objective	• To project the physico-chemical properties various of milk products. • To impart the effects of various milk constituents of the milk products during manufacture and storage.			
Learning Outcome	• To gain knowledge on physicochemical properties of milk products • To gain knowledge on critical factors in milk products • To gain knowledge on different testing methods			

Unit	Content
I.	**Fat rich products** – Cream- chemical composition- physio chemical properties – effect of fat percentage of cream on its specific gravity – neutralization of cream. Butter – chemical composition - physico-chemical characteristics. effect of heat on Ghee and butter oil; Fat constants - Rancidity and auto-oxidation in ghee mechanism.
II.	**Concentrated milk products**- Physico-chemical changes during manufacturing and storage of concentrated milk- crystallization – heat stability of concentrated milk – age thickening and gelation of concentrated milk. Effect of heat on dried milk – chemical quality - physico-chemical properties of dried milk.
III.	**Fermented milk products** – chemical composition of Dahi, Yoghurt – physicochemical characteristics of fermented dairy foods- Changes during formation of curd- chemistry of shrikhand – chemistry of yoghurt.
IV.	**Acid coagulated products:** Panner - channa- - chemical composition and factors affecting quality shelf-life and preservative.
V.	**Frozen milk product:** Ice cream – specification – Role of the constituents in Ice

	cream - properties of ice cream mix – physiochemical nature of icecream- action of stabilizers and emulsifiers in ice cream. Kulfi: standards - physiochemical properties.
References:	
Text Books	3. Fox PF. 1985. Developments in Dairy Chemistry. Vol. III. Applied Science Publ. 4. Law BA. 1997. Microbiology and Biochemistry of Cheese and Fermented Milks. 2nd Ed. Blackie Academic and Professional, Chapman &Hall.
Reference Books	1. Mathur MP, Roy DD &Dinakar P.1999. Textbook of Dairy Chemistry. ICAR. 2. Walstra P &Jenness R. 1984. Dairy Chemistry and Physics. John Wiley & Sons. 3. Wong NP, Jeness R, Keeney M & Elmer HM. 1988.Fundamentals of Dairy Chemistry. Van Nostrand Reinhold Co
Web Resources	https://www.myvmc.com https://www.dairyfoods.com

Semester	**VII**			
Course Code	**24DTVC4706**			
Course Title	**MICROBIOLOGY OF MILK PRODUCTS**			
No. of Credits	4		**Contact Hours per week**	4
New / Revised Course	**New Course**		**Percentage of Revision effected**	-
Category	**NSQF**	General Education Component		
	NEP	Major -19		
Course Objective	• To impart current knowledge on basic and applied microbiological aspect of milk and milk products for improved quality. • To facilitate the students to analysis the microbial examination of various dairy products.			
Learning Outcome	• To gain knowledge on microbial quality of milk products • To gain knowledge on critical factors in milk products • To gain knowledge on microbial analysis methods for milk products			

Unit	Content
I.	**Importance of dairy microbiology** – Types of microbes in milk products and their morphology – Milk borne diseases – Microbiology of heat processed milk – Bacteriological problems associated with pasteurization sterilization - Bacteriological standards for processed milks – emerging pathogens in milk - mycotoxins in milk – Anti-microbial system in raw milk - Inhibitors in milk –microbiology of milk at farm level.
II.	**Bacteriology of starter cultures**-Types-Function- Propagation – Preservation methods – Factors affecting activity of starter cultures – role of starter in dairy fermentation. Characteristics of good starter culture – Bacteriophage action in starter cultures and its control measures.
III.	**Microbiology of fermented milk products and cheese–**fermented milk and food borne diseases - Microbial spoilage of fermented milk and their control measures –

	microbial analysis of fermented milk. Microbiology of cheese – cheese and food borne disease – production of biogenic amines in cheese – spoilage of cheese – microbiological examination of cheese.
IV.	**Microbiology of cream and cream based products** – spoilage of cream and cream based products – microbiological analysis of cream – microbiology of butter – spoilage of butter – microbiological analysis of butter – microbiology of ice cream – ice cream and food borne disease – bacteriological standards of ice cream – microbial analysis of ice cream.
V.	**Microbiology of concentrated and dried milk products –** concentrated and dried milk product and food borne disease – spoilage microflora of concentrated milks – microflora of dried milk powder – microbial analysis of concentrated and dried milk products – Microbial control of new Non thermal methods – controlling microbial quality of food and food standards.

References:

Text Books	2. Foster E.M (1957) Dairy Microbiology, Prentice Hall Inc, USA. 3. Pelczar, Chan (1997), Microbiology, Tata MC Graw, Hill Publishing Co. Ltd., New Delhi. 4. Ramasamy (1999) Dairy Technologist's Hand Book, International Book Distributing Co, Lucknow
Reference Books	2. Srivastava.L. (2002)., Hand Book of Milk Microbiology, Daya Publishing House, Delhi. 3. Yadav, J.S Sunita Grover and V.K. Batish (1993), A Comprehensive Dairy Microbiology, Metropolitan Book Co. Pvt. Ltd., New Delhi.
Web Resources	**https://www.dairyfoods.com**

Semester	**VII**		
Course Code	**24DTVC4707**		
Course Title	**CHEMISTRY OF MILK PRODUCTS – PRACTICAL**		
No. of Credits	4	**Contact Hours per week**	4
New / Revised Course	**New Course**	**Percentage of Revision effected**	-
Category	**NSQF**	Skill Development Component	
	NEP	Major -20	
Learning Outcome	• Students will gain practical knowledge on handling of lab analytical instruments • Students will get practiced on various chemical analysis		

Practicals

1. Determination of acidity and pH in dahi
2. Determination of fat in condensed milk
3. Determination of acidity in condensed milk
4. Determination of heat stability of condensed milk
5. Determination of moisture in paneer
6. Determination of fat in cheese
7. Determination of fat in ice cream by Gerber method
8. Determination of fat in cream by Gerber method
9. Determination of acidity in cream
10. Determination of fat in butter
11. Determination of moisture in cream and butter
12. Determination of free fatty acids in butter
13. Determination of RM, Polenske value, iodine value

Semester	**VII**		
Course Code	**24DTVC4708**		
Course Title	**MICROBIOLOGY OF MILK PRODUCTS – PRACTICAL**		
No. of Credits	4	**Contact Hours per week**	4
New / Revised Course	**New Course**	**Percentage of Revision effected**	-
Category	**NSQF**	Skill Development Component	
	NEP	Major -21	
Learning Outcome	• Students will gain practical knowledge on handling of microbial equipments • Students will get practiced on various microbial analysis		

Practicals

1. Sampling techniques of milk and milk products
2. Microbial analysis of UHT milk
3. Propagation and preservation of starter culture
4. Microbial analysis of dahi
5. Microbial analysis of yoghurt
6. Microbial analysis of cheese
7. Microbial analysis of cream
8. Microbial analysis of butter
9. Microbial analysis of ice-cream
10. Microbial analysis of condensed milk and evaporated milk
11. Microbial analysis of dried milk

Semester	**VII**		
Course Code	**24DTVE4709**		
Course Title	**DAIRY PLANT: RESEARCH AND DEVELOPEMT SECTION (INTERNSHIP -7)**		
No. of Credits	10	**Contact Hours per week**	10
New / Revised Course	**New Course**	**Percentage of Revision effected**	-
Category	**NSQF**	Skill Development Component	
	NEP	Field study	
Course Objective	• Students have to undergo Inplant training at an established dairy unit and should learn the research and development activities.		

WORK PLAN

1. Students will learn on calibration of various equipment and devices furnished in the dairy laboratories.
    a. Practice the general laboratory procedures, care and maintenance of research equipments and safety measures while in lab.
    b. Preparation of buffers
    c. Determination of pH using pH meter.
    d. Practicing and handling of centrifuge and water bath.
    e. Practicing and handling of viscometer and flame photometer.
    f. Practicing and handling of calorimeter.
    g. Practicing and handling of different types of microscope and colony counter.
    h. Practicing and handling of autoclave and muffle furnace.
    i. Practicing and handling of laminar air flow chamber and Incubator.
    j. Practicing and handling of hot air oven and micro oven.
    k. Practicing and handling of advanced lab equipments for estimation of milk constituents in dairy products.
    l. Handling of Soxplus
    m. Handling of Kelplus

n. Handling of Fibroplus

o. Safe disposal of chemicals and glasswares.

2. 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.

3. Practice on managerial skills to run a plant

Assessment

Students who underwent the In-plant training should submit a report based on the research and development 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.

SEMESTER – VIII

Semester	**VIII**		
Course Code	**24DTVS4801**		
Course Title	**CREDIT SEMINAR**		
No. of Credits	5	**Contact Hours per week**	5
New / Revised Course	**New Course**	**Percentage of Revision effected**	-
Category	**NSQF**	General Education Component	
	NEP	Skill Enhancement Course-8	
Course Objective	• To train the students in preparing and presenting technical topics. • To assess and improve capability of the students in presenting their topics of research		
Learning Outcome	• The student shall be capable of identifying topics of interest related to the program of study and prepare and make presentation before an enlightened audience.		

Work Plan

The students are expected to give presentation on their topic of interest which will be assessed by a committee constituted for this purpose. This course is mandatory and a student has to pass the course to become eligible for the award of degree. The presentation will be evaluated through internal examiners.

Semester	**VIII**		
Course Code	**24DTVC4802**		
Course Title	**PROJECT**		
No. of Credits	25	**Contact Hours per week**	
New / Revised Course	**New Course**	**Percentage of Revision effected**	
Category	**NSQF**	Skill Development Component	
	NEP	Major -22	
Course Objective	• To identify the research area relevant to the program of study. • To undertake research in an area related to the program of study.		
Learning Outcome	The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.		

Work Plan

B.Voc (Honors) projects should be scientific relevant and research oriented ones. Each student is expected to do project. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner. This evaluation will be based on the project report presentation and viva voce examination on the project.

MULTI DICIPLINARY COURSES

FOR

INTERDEPARTMENT LEVEL (UG)

Semester	**I**		
Course Code	**24DTVI1107**		
Course Title	**MILK AND MILK PRODUCTS**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	New Course	**Percentage of Revision effected**	-
Category	**NEP**	Multidisciplinary Course	
Course Objective	• To enlighten the students about the processing and marketing of milk. • To gain an understanding of manufacturing methods and production of dairy products.		
Learning Outcome	• Students will learn about the properties of milk • Students will learn about the Milk processing and market • Students will learn about the production techniques of dairy products.		

Unit	**Content**
I.	**Properties of Milk:** Milk - definition – Composition - Nutritive value of milk – Properties of milk – colostrums. Clean milk production. Bacteriological standard for raw milk. MBRT.
II.	**Milk Processing and Market:** Milk Collection, Transportation, Chilling, Homogenization, Pasteurization, Sterilization, UHT processing and Packaging; Market milk – standardized – Toned – Double toned — common adulterants and preservatives in milk
III.	**Milk Products - I: Fat and Protein Rich Milk Products:** Definition – composition - standards - method of manufacture of, cream, butter, Ghee, cheese and paneer
IV.	**Milk Products – I : Fermented and Frozen Milk Products:** Definition – composition - standards - Method of manufacture of Curd, Yoghurt, Buttermilk, Ice cream and Kulfi – nutritive value - therapeutic benefits of fermented milk products.
V.	**Milk Products - II: Traditional Dairy Products:** Definition – composition - standards - method of manufacture of Flavoured milk, Khoa, Peda, Gulab jamun, Rasagulla, Kheer.

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.
Reference Books	1. W.E.Peterson,Ph.D(2005) vol-2 Dairy Science its principles and practice production, management of processing- Asiatic publishing house-New Delhi 2. Walstra, P. Wouters, J.T.M. and Geurts, T.J. 2006. Dairy Science and Technology. CRC Press, New York.
Web Resources	• www.agrimoon.com

Semester	**II**		
Course Code	**24DTVI1207**		
Course Title	**DAIRY PROCESSING TECHNOLOGY**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	New Course	**Percentage of Revision effected**	-
Category	**NEP**	Multidisciplinary Course	
Course Objective	• To enable the students to acquire skill in processing of milk • To gain knowledge on various methods of milk processing.		
Learning Outcome	• This course provides details about various processes 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	Content
VI.	**Milk Procurement** - Principles of milk production - Selection of milk shed area – milking practices - clean milk production - importance - sources of micro organisms– Raw milk collection - Milk Collection Centres and their functions - Role and responsibility of procurement officer - Establishment of Dairy Cooperatives - Pricing of milk.
VII.	**Transportation of milk:** Modes of transport – earlier methods – recent developments – selection of mode of transportation of milk. Distribution of milk: Importance – raw milk distribution – attribution of pasteurized milk – bulk distribution – retail distribution of pasteurized milk.
VIII.	**Preservation:** Definition - types of milk preservation. Chilling – meaning - methods of chilling – importance of milk chilling - merits and demerits – Cold storage chain. **Quality testing of market milk:** Common adulterants, preservatives and neutralizers -present status of preservation of raw milk.
IX.	**Milk reception:** concept – unloading– sampling – basics involved in platform test – weighing, measuring and recording. Straining - filtration and clarification of milk -

	mechanism.
X.	**Processing**- standardization - homogenization - Heat treatment of milk: pasteurization sterilization- Market milk industry in India – milk quality standards and certificates- Sterilized milk – Flavoured milk – pasteurized milk – Standardized milk – Toned milk – Double toned milk – Recombined milk – Reconstituted milk. Packaging .
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.
Reference Books	1. W.E.Peterson,Ph.D(2005) vol-2 Dairy Science its principles and practice production, management of processing- Asiatic publishing house-New Delhi 2. Walstra, P. Wouters, J.T.M. and Geurts, T.J. 2006. Dairy Science and Technology. CRC Press, New York.
Web Resources	• www.agrimoon.com

Semester	**III**		
Course Code	**24DTVI2308**		
Course Title	**FUNCTIONAL DAIRY PRODUCTS**		
No. of Credits	3	**Contact Hours per week**	3
New / Revised Course	New Course	**Percentage of Revision effected**	-
Category	**NEP**	Multidisciplinary Course	
Course Objective	• To impart the knowledge of functional ingredients, nutraceuticals and their utilization in development of new food products including health foods, functional foods and specialty foods.		
Learning Outcome	Upon completion of the course, the students will be able to: • be familiar with the basic concepts and terminology of functional foods; • learn the functionality and therapeutic benefits. • able to develop new functional dairy product		

Unit	**Content**
I.	**Value addition:** Importance of value addition in milk and milk products. Global trends and market potential for functional milk products.
II.	**Functional foods:** Definition, role in promoting human health. Nutraceuticals: Definition, classification based on sources of nutraceuticals, Concept of new product development, prospective nutraceuticals for fortification of dairy foods. Advances in different types of functional dairy products.
III.	**Food fortification:** Techniques for fortifying dairy foods with minerals and vitamins. High protein foods. Technological aspects of reduced calorie foods: alternatives for calorie reduction, low calorie sweeteners, bulking agents and their application, fat replacers and their utilization in low calorie dairy foods. Bio-flavours and flavour enhancers.
IV.	**Bioactive components:** Casein, lactose, whey proteins, immunoglobulin, lactoferrin, milk minerals, prebiotics, probiotics and synbiotics. Physio-chemical properties and role of milk constituents.

V.	**Utilization of non dairy ingredients in milk products:** Utilization of cereal, pulses and legume, fruits and vegetable – roots and tubers - sea sources - herbs with special reference to milk and milk products – scope - merits and demerits. Utilization of agro and food wastes.
References:	
Text Books	1. Chadwick R. 2003. Functional Foods. Springer. 2. Gibson G & William C. 2000. Functional Foods. CRC Press. 3. Mitchell JR & Ledward DA. 1986. Functional Properties of Food Macromolecules. Elsevier. 4. Mudambi SR & Rajagopla MV. 1981. Fundamentals of Foods and Nutrition.
Reference Books	1. Pomeranz Y. 1991. Functional Properties of Food Components. Academic Press. 2. Saltmarch M & Butriss J. (Ed.). 2000. Functional Foods II: Claims and Evidence. Royal Society of Chemistry, London. 3. Shi J, Mazza G & Maguer M Le. 2002. Functional Foods: Biochemical and Processing Aspects. CRC Press.
Web Resources	www.agrimoon.com