B. Tech. Dairy Technology

Course Duration- Four Years with Eight Semesters

Programme Outcomes: (PO's)

The B.Tech program of Dairy Technology at SVPUAT, Meerut started in 2021-22.The syllabus of B.Tech. Dairy Technology is designed in such a way that all the 46 courses with StudentREADYProgramme havetheir own objectives and methodology to achieve their respective course outcomes. All the papers combine theoretical inputs with specificpractical related to the needs of various fields of Dairy Technology teaching and research. To achieve the programme specific outcomes, teachers have to use various direct or indirect methods to achieve overall pedagogical objectives.

- To establish itself as the leader in human resource development for supporting thedairy technology sector.
- To provide knowledge and skills for better processing, preservation and valueaddition techniques to milk and milk products.
- To promote research and development for dairy products and process andGuarantee sanitation and safety of processed dairy items.
- To provide well equipped infrastructure and research facilities to students for carrying outresearch smoothly in allied fields of dairy technology.
- To develop good professional relationship with the leading institutions at national andInternational level.
- To develop the spirit of competition among students and help them to cultivateenthusiasm, self-confidence, problem solving capacity, self respect and to develop communication skills.
- To develop awareness among the students about environmental issues and work towardsSustainable developments.
- To impart knowledge in various aspects of Dairy Technology through theory andpractical knowledge.
- To impart the knowledge about various compounds such as protein, carbohydrates, lipids amino acids, minerals, vitamins etc associated with the chemical compositions of milk and milk products their structures and functions.
- To make the students familiar with the technologies of dairy products processing and preservation.
- To gain concepts of safety and quality managements, national and internationalfood laws and regulations as well as importance in food industry.
- To gain knowledge about advanced technologies adapted in various dairy industries byphysically visiting different dairy industries.
- To develop broader understandings on various aspects of management of waste comingfrom dairy Industries as well as from homes starting from its generation to processing with options for reuse and recycle, transport, and disposal practices so as to contribute towards sustainable development.
- To development students' understanding and communication skills through variousassignments which will enable them to develop skills in writing and effective's interpersonal skills. Presentations in different topics enhances their confidence, ability to express themselves & presentation skills
- Give students assistance in preparing for competitive exams e.g. GATE, etc

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COURSE OUTCOMES: After completion of the course, a student will be able to achieve these outcomes

Semester	Course Name	Course Code	Course Outcome
I[st]	Workshop Practice	DDE-111	**CO1:**Use various engineering materials, tools, machines and measuring equipments. **CO2:** Perform machine operations in lathe and CNC machine. **CO3:**Perform manufacturing operations on components in fitting and carpentry shop. **CO4:** Perform operations in welding, molding, casting and gas cutting. **CO5:**Fabricate a job by 3D printing manufacturing technique
	Fluid Mechanics	DDE-112	**CO1:**Understand the broad principles of fluid statics, kinematics and dynamics. **CO2:** Understand definitions of the basic terms used in fluid mechanics. **CO3:**Understand classifications of fluid flow
	EngineeringDrawing	DDE-113	**CO1:** Use scales and draw projections of objects. **CO2:** Explain views of solids and their sectional surfaces. **CO3:**Analyze and draw isometric projections of objects. **CO4:**Demonstrate orthographic representation of perspective views using modern tools. **CO5:** Apply AutoCAD software for creation of engineering drawing and models
	FundamentalsofMicrobiology	DDM- 111	**CO1:** This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures. **CO2:** Understanding the details of microbial cell organelles. **CO3:** Provides knowledge on the growth of microorganism. **CO4:**Provides knowledge culturing microorganism.
	MilkProductionManagementandDairyDevelopment	DBM-111	**CO1:**To develop basic idea about animal husbandry and to learn farm management practices. **CO2:** To generate knowledge about the milk production channel in dairy animals and feed resources. **CO3:** To access knowledge on reproduction

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	Communication Skills	DBM-112	**CO1:** The students will Gain Self Competency and Confidence. **CO2:** They will be fluent speaker and proficient writer and enhance their LSRW Skills. **CO3:** The students will demonstrate a fuller and deeper understanding of all the facets of Professional communication. **CO4:** They will be able to enrich their vocabulary and their correct usage. **CO5:** They will develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation.
	Computer and Application Software Packages	DBM-113	**CO1**: Converse using the language of computers. **CO2:** Formulate viewpoints on the social effects of computers. **CO3:** Possess a rudimentary understanding of peripheral hardware. **CO4:** Know and use several number systems. **CO5:** Students learn to Work in MS office. **CO6:** Students gain knowledge of productivity software and operating systems. **CO7:** Student's interest grows in using computer for work-related purposes. **CO8:** Students will be able to identify their programming interests.
	Biochemistry	DDC-111	**CO1:** In this course, students will extend their knowledge of biochemistry fundamentals and will learn about the significance of biochemistry and important metabolic processes taking place in plants. **CO2:**Acquire a detailed knowledge about the chemistry of carbohydrates, lipids, proteins and amino acids and their classification, structural organization of proteins, metabolism of saccharides, lipids.
	EnvironmentalStudies	DBM-114	**CO1:**Understand the natural environment and its relationships with human activities. **CO2:**Characterize and analyze human impacts on the environment. **CO3:**Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems. **CO4:**Capacity to integrate knowledge and to analyse, evaluate and manage the different public health aspects of disaster events at a local and global levels

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II[nd]	Thermodynamics	DDE-121	**CO1:** Apply the knowledge of thermodynamics to temperature scales 60 **CO2:** Utilize the concepts of work and energy to evaluate control volumes as well as closed systems. **CO3:** Students will be able to do energy analysis and determine efficiency of various thermal devices **CO4:** Students are able to identify steam proprieties from steam tables and Mollier charts
	PhysicalChemistryofMilk	DDC-121	**CO1:** Students will be able to explain the milk as colloidal system along with its properties 74 such as density, specific gravity etc. **CO2:** Determine the electrical conductance redox potential of milk and pH etc. **CO3:** To know about the field of molecular spectroscopy, nuclear chemistry related to milk.
	Heat&MassTransfer	DDE-122	**CO1:** Understand the basic modes of heat and mass transfer. **CO2:** Apply principles of heat and mass transfer to predict transfer coefficients **CO3:** Analyze working of various heat transfer equipment **CO4:** Design heat and mass transfer equipment.
	BoilersandSteamGeneration	DDE-123	**CO1:** Students study renewable and nonrenewable energy source, steam, Mollier chart, boilers and its performance. **CO2:** Able to learn different types of boilers and its working and safety. **CO3:** Be able to understand layout of steam pipeline and expansion joints and boiler draught. **CO4**: Able to gain knowledge about Indian Boiler regulation act. **CO5**: Be able to understand the principles and workings of air compressor and its types.
	BasicElectricalEngineering	DDE-124	**CO1:** Ability to understand and analyse basic electric and magnetic circuits. **CO2:** Ability to study the working principles of electrical machines and power converters. **CO3:** Ability to introduce the components of low-voltage electrical installations.
	Microbiologyof fluid milk	DDM-121	**CO1:** Able to estimate microbial quality and microbial load in raw milk. **CO2:** Determine the mastitic milk from raw milk. **CO3:**Demonstrate the sources of contamination of raw milk
	ChemistryofMilk	DDC-122	**CO1:** Able to determine total milk protein, fat content, total solids and SNF in milk. **CO2:** Estimate different enzymes such as alkaline phosphate and lipase in milk. **CO3:** Determine the content of lactose, ash, phosphorous and calcium in milk.
	Student READY Rural Dairy Work Experience	DRW-121	**CO1:** Provide exposure to the students to the areas on milk production at cattle farm, dairy farm and progressive dairy farmer.

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	Programme-I (Summer Break)		CO2: To provide exposure to the students to the areas on milk procurement at state dairy federation/ dairy development department/ private dairy. CO3: Students able to learn about collection of milk, quality testing, chilling and storages.

III[rd]	MarketMilk	DDT-211	**CO1:** Explain the list of pre-treatments of milk in dairy processing plant. **CO2:** Describe aseptic packaging as well as detect adulterants in milk. **CO3:**Able to prepare special types of milk (toned, double toned, standardized, flavoured, sterilized).
	TraditionalIndianDairyProducts	DDT-212	**CO1:** Able to prepare a great assortment of dairy products such as burfi, peda, kalakand, milk cake, gulabjamun, sandesh, rosogolla, kheer, rabri etc. **CO2:**Explain the standard methods of manufacture of different dairy based products. **CO3:** Explain the advances in preservation and packaging of products.
	Refrigeration &Air-conditioning	DDE-211	**CO-1:** Students learn refrigeration and air conditioning principles, concepts, and technologies for dairy farms. **CO-2:**Able to learn refrigeration, air conditioning, temperature control, and dairy processing and storage techniques. **CO-3:**Able to quantify the performance of refrigerants and their properties. **CO-4:** Be able to understand the principles and workings of ARS, VCRS, VARS, and psychrometry. **CO-5:** Be able to understand the principles and workings of the air washer, sling psychrometer, ice plant, and desert cooler. **CO-6:** Food safety and how refrigeration and air conditioning systems keep dairy products safe are taught.
	Dairy Engineering	DDE-212	**CO1:** Acquaint the students with various dairy engineering operations such as sanitization homogenization, pasteurization, thermal processing and evaporation etc. **CO2:** Understand the different types of equipment and their working principles

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	Fat Rich Dairy Products	DDT-213	**CO1:**Understand the different fat rich dairy products and their status in India and abroad. **CO2:**Processes and manufacture of cream, butter, and ghee as per legal standards and guidelines. **CO3:**Packaging, storage and compositional changes of cream, butter, and ghee.
	Condensed&Dried Milks	DDT-214	**CO1:** Able to manufacture different types of condensed and formulated dried products by grading the quality of raw milk. **CO2:** Explain various national and international standards for condensed and dried milks. **CO3:** Describe the chemical defects, their causes and prevention in condensed and dried milks. **CO4:** Develop concepts with reference to freeze concentration and membrane concentration.
	HumanNutrition	DDC-211	**CO1:** Learn the basic information about human nutrition. **CO2:** Understand the factors that affect the human nutrition. **CO3:** Know the nutritional and energy requirements of human beings at different stages of life, in the physiological situations associated with nutrition. **CO4:** Learn how to carry out and interpret the nutritional assessment of an individual

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IVth	DairyProcessEngineering	DDE-221	**CO1:** Students will learn about milk evaporation, drying, spray dryer, drum dryers, fluidization. **CO2:** Students will also learn about processing equipment like butter making machines, ghee making machines, cheese making machines.
	StarterCulturesandFermentedMilkProducts	DDM-221	**CO1:** Characterize different types of beneficial

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			microorganisms that can be incorporated in the development of fermented dairy foods. **CO2:** Implement improvement strategies to develop better starters for dairy industry. **CO2:** Prepare different types of fermented milk products possessing nutritional and therapeutic benefits.
	Microbiology of Dairy Products	DDM-222	**CO1:** Acquire knowledge on micro-environment of different indigenous dairy products. **CO2:** Explain the public health significance of various dairy products. **CO3:** Implement the packaging concepts in dairy industry to avoid spoilage and enhance shelf-life of dairy products.
	CheeseTechnology	DDT-221	**CO1:** Able to manufacture Cheddar cheese, Gouda cheese, Mozzarella cheese, Swiss cheese, Cottage cheese, Processed cheese and Processed cheese spread. **CO2:** Explain application of membrane processing in cheese manufacture. **CO3:** Demonstrate the factors affecting yield of cheese, packaging, storage and distribution of cheese.
	Ice-cream & Frozen Deserts	DDT-222	**CO1:** Understand the definition, classification and composition and standards of ice cream and other frozen desserts. **CO2:** To know the effect of process treatments on the physico-chemical properties of icecream mixes and ice cream. **CO3:** Able to understand the advances in ice-cream industry and plant management.

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	Chemistry of Dairy Products	DDC-221	**CO1:** Understand chemical composition and legal standards of milk products. **CO2:** Know about the physico-chemical changes during manufacture and storage of traditional dairy products, concentrated and dried milk products and ice cream and frozen desserts.
	FundamentalsofDairyExtension	DBM-221	**CO1:**This course helps students to transfer knowledge of Dairy Technology to their clients successfully. **CO2:**students able to understand how and when the dairy Extension developed in India. **CO3:** This course thought them different method of data collection in real situation. **CO4:** Fundamentals of Dairy Extension is Behavioral Course so help them to develop communication skills in the students.
	StudentREADYRuralDairyWorkExperience Programme-II (SummerBreak)	DRW-221	**CO1:**To provide exposure onpreliminary dairy operation to be taken up in experimental dairy/ referral lab/dairy plants. **CO2:** Student able to know about product manufacturing operation in dairy and food Industry such as pasteurization, homogenization, sterilization, packaging and storage.

Vth	InstrumentationandProcessControl	DDE-311	**CO1:** Understand the instrumentation scheme and characteristics. **CO2:** Learn about the various types of sensors. **CO3:** Role and importance of electronics instruments. **CO4:** Able to know aboutplant automation PLC,SCADA.
	QualityandSafetyMonitoringinDairyIndustry	DDM-311	**CO1:** Understand the consumer awareness about microbiological quality and

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			safety of dairy foods. **CO2:** Learn the quality and food safety management system concepts and principles. **CO3:** Develop concepts on microbiological risk analysis and hygiene in dairy plant.
	By Products Technology	DDT-311	**CO1:** Able to manufacture edible casein from cow and buffalo milk, rennet casein, sodium and calcium caseinate. **CO2:** Can manufacture whey proteins, whey drinks, dried whey and coffee whitener. **CO3:** Process butter milk (condensed butter milk, dried butter milk) and utilize butter milk products.
	PackagingofDairyProducts	DDT-312	**CO1:** Identify different types and characteristics of packaging materials. **CO2:** Able to test glass bottle - resistance to thermal shock. **CO3:** Proficiency in testing of plastics and laminates-thickness, water vapour transmission rate and grease resistance.
	ChemicalQualityAssurance	DDC-311	**CO1:** Learn the quality and food safety management system concepts and principles **CO2:** Learn national and international food laws **CO3:** Preparation and standardization of dairy reagents **CO4:** Able to calibrate dairy glassware **CO5:** Detect adulterants, preservatives, and neutralizers in milk and milk products
	Marketing Management and International Trade	DBM-312	**CO1:** Developing knowledge and skills in market research, including market measurement, segmentation, targeting, and positioning. **CO2:** Understanding the fundamental concepts and functions of marketing, and how to effectively manage marketing activities.

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			CO3: Gaining insights into marketing channels, retailing, and distribution, and understanding their importance in reaching target markets. **CO4:** Acquiring knowledge of international marketing and trade, including export strategies, market entry modes, and the role of government institutions in facilitating international food trade. **CO5:** Exploring product policy and planning, including product development, branding, packaging, and making strategic pricing decisions.

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VI[th]	FoodEngineering	DDE-321	**CO1:** Understand the basic modes of heat transfer in foods. **CO2:** Interpret and analyze forced and free convection heat transfer. **CO3:** Formulate and solve convective heat transfer problems. **CO4:** Able to calculate freezing time and freezing rate. **CO5:**Understand mechanisms of moisture removal in foods.
	Dairy Plant Design and Layout	DDE-323	**CO1:** Students will learn various aspects of dairy plant design and layouts such as classification, hygienic design consideration, dairy building planning, and principles of design layout. **CO2:** Students will also learn about building constructional materials and to draw layout of different dairy product plants such as butter, ghee, cheese etc
	Food and Industrial Microbiology	DDM-321	**CO1:** Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival. **CO2:** Illustrate the use of basic microbiological methods for the evaluation of the microbial load in the different food matrices. **CO3:** Able to compare various physical and chemical methods used in the control of microorganisms. **CO4:** Involved in the production of different industrial products from microorganisms in industries.
	SensoryEvaluationofDairyProducts	DDT-321	**CO1:** Understand the importance and basic principles of sensory evaluation processes. **CO2:** Analyze factors influencing the sensory quality of different dairy based food and food products. **CO3:**To know about consumer acceptance studies and interrelationship of various instrumental and physico-chemical tests.
	Food Technology- 1	DDT-322	**CO1:** Status of food processing industries in India and abroad **CO2:** Understand the role of processing in terms of shelf life, safety, nutritional and economic value of fruit and vegetables.

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			CO3: Gain knowledge about post harvest processing of fruits and Vegetables. **CO4:** Gain knowledge on production, preservation and packaging of jam, jelly, marmalade, pickles, and candies.
	FoodChemistry	DDC-321	**CO1:**To understand the properties of different carbohydrate components and interactions among these components to regulate the specific quality attributes of food systems. **CO2:** Students are expected to understand the role of proteins /enzymes in foods and be able to control the major chemical and biochemical (enzymatic) reactions that influence food quality with emphasis on food industry applications. **CO3:** To understand the chemical composition of lipids, their physical properties, methods to modify the fatty acid and triacylglycerol composition, tendency of lipids to undergo oxidative deterioration, and the role of lipids in health and disease. **CO4:** Understanding of the chemical and physical factors that influence vitamin, mineral and pigment retention and bioavailability in foods

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Semester	Course Name	Course Code	Course Outcome
VII[th]	StudentREADYIn-PlantTraining	DPT-411	**CO1:** Gain practical skills and hands-on experience through experiential learning in pilot plants for processing various dairy products such as market milk, ice cream, milk powder, cheese and their By-products etc. **CO2:** Develop entrepreneurship attributes and enhance employability for better work readiness and self-employment opportunities. **CO3:** Acquire industry-relevant knowledge and skills, improving readiness for the job market and entrepreneurship.

Semester	Course Name	Course Code	Course Outcome
VIII[th]	DairyPlantManagement	DDT-421	**CO1:** Able to define management, production planning and control **CO2:**Learning about energy conservation, auditing, financial and managerial efficiency **CO3:** Will be able to know about safety hazards, prevention and breakdown maintenance, and food hygiene.
	WasteDisposalandPollutionAbatement	DDT-422	**CO1:** Explain the utilization of dairy wastes and implement various treatments for waste disposal. **CO2:** Analyse different cleaning agents and sanitizers. **CO3:** Able to report and record the maintenance of dairy plant.
	Food Technology -II	DDT-423	**CO1:** Understand basic composition & structure of food grain. **CO2:** Understand the basics of milling operations. **CO3:** Understand the processing of fish and meat products. **CO4:** Impart knowledge on bakery and snacks technology.

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	Entrepreneurship Development and Industrial Consultancy	DBM-421	**CO1:** Able to create presentations and business plans that articulate and apply financial, operational, organizational, market, and sales knowledge. **CO2:** Identify and secure customers, stakeholders through networks, primary customer research, and competitive and industry analyses in order to pursue an initial target market in real-world projects. **CO3:** A student can assess entrepreneurial skills and characteristics to become a successful entrepreneur
	Financial Management & Cost Accounting	DBM-422	**CO1:** Asses how cost-volume-profit is related and use of CVP analysis as a planning and decision-making aid. **CO2:** Identify problems on ratio analysis, break even analysis, profit analysis and operating analysis.
	StudentREADYExperientialLearningModule	DEL-421	CO1: Create a Detailed Project Report for establishing a product manufacturing enterprise. CO2: Evaluate the module to identify areas for improvement in the experiential learning process.

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