FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Dairy Technology)**

Semester: **VII**

Course Code:

Course Title: **Energy Conservation and Management in Dairy Sector**

Course Group: **Program Elective Course - III**

Course Objectives: To provide a comprehensive understanding of energy conservation principles, management strategies, and their significance in the dairy industry. The course covers the fundamentals of energy conservation, the 3Es—Energy, Economics, and Environment—and their interrelationship, as well as energy auditing techniques in energy systems for reducing energy consumption, optimizing efficiency and integrating renewable energy solutions.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total
2	0	3	3	50 / 18	50/ 17	25 / 9	25 / 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Sr. no.	Content	Hours
1	**Introduction** Classification of Energy, Present and Past Scenario of Primary Energy Resources in the India and World, Potential and opportunities of industrial energy conservation in dairy and food processing, Environmental Aspects Associated with energy utilization, energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future. Energy Conservation Act 2001 and its important features, Schemes of Bureau of Energy, Efficiency (BEE). Electricity Act 2003, Integrated energy policy, Electrical load management, Demand management, energy management information systems.	**07**
2	**Energy Management & Audit**	**07**

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	Definition: energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, Bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering	
3	**Energy efficiency and conservation in utilities** High efficiency boilers, improved combustion techniques for energy conservation, Pumps and pumping systems, Fans, Blowers, Air compressors, Wastewater treatment plant. Improving efficiency and energy conservation opportunities of thermal processes, improving efficiency and energy conservation in evaporation, Improving Efficiency and Energy Conservation Opportunities in Food Drying.	**08**
4	**Energy Monitoring and Targeting** Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques – energy consumption, production, cumulative sum of differences (CUSUM).	**03**
5	**Energy and environment, air pollution, climate change** United Nations Framework Convention on Climate Change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), CDM Procedures case of CDM	**03**
	Total	**28**

List of Tutorial

Sr. No	Practical
1	Study of Energy Conservation Act 2001
2	Solving problems on electrical energy use and management: Connected load, Maximum demand, Load factor and Load curve
3	Study of various types of electrical appliances classified under different BEE Star Ratings.
4	Study of the boiler and determination of indirect efficiency of boiler
5	Exercise on energy audit of ADIT Workshop or Dairy Technology Lab
6	Check the energy efficient components: Positive Displacement Air Compressors
7	Check the energy efficient components: Pumps
8	Case study of Energy audit in Dairy Plant
9	Check the energy efficient component: Refrigerator
10	Study of energy monitoring and targeting

Reference Books:

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1	Bureau of Energy Efficiency, "Energy Manager Training Manual", Reference book No:1 to 4.
2	Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience publication
3	Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press
4	Energy Engineering and Management by Amlan Chakrabarti , PHI Learning
5	Energy Management by Murphy W R, Butterworth-Heinemann Ltd
6	Energy Management and Conservation by K V Sharma and P Venkataseshaiah, I K International Publishing House Pvt. Ltd

Supplementary learning Material:	
1	http://nptel.iitm.ac.in/
2	www.bee.com
3	https://geda.gujarat.gov.in/

Pedagogy:

- Direct Classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Interactive methods
- Seminar/Poster presentation

Internal Evaluation:
Teacher may consider some components for the continuous evaluation where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks					
R	**U**	**A**	**N**	**E**	**C**
15%	25%	20%	20%	15%	5%

R: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

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Sr.	Course Outcome Statements	%weightage
CO-1	To understand the basic knowledge of different terms & principles of energy conservation, audit and management	**25**
CO-2	Apply energy conservation policy, regulations in industrial practices.	**20**
CO-3	Analyze the thermal and electrical systems for energy efficiency.	**35**
CO-4	Understand and analyze the energy monitoring and targeting for different energy conservation instances and climate change	**20**

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	Dec-22
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	Jun-25

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