LECTURE SCHEDULE

Department: Dairy Engineering

Course No. - DTE- 324

Course Title: Energy Conservation and Management Credit Hrs - 2 (1+1)

Course Teacher: Dr. Jahangir Badshah

Theory

S. No.	Topics to be covered	No. of Classes
1	Introduction: Potential and opportunities of industrial energy conservation in dairy and food processing.	01
2	Energy conservation Act 2001 and its important features, Schemes of Bureau of Energy Efficiency (BEE).	01
3	Electricity Act 2003, Integrated energy policy. Energy management & audit: Definition, energy audit, need, types of energy audit.	01
4	Energy 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.	02
5	Energy balances and computation of efficiencies of equipment. Role of Energy inspectors and Auditors in energy management.	01
6	Electrical load management: Demand management, energy management information systems, Energy saving controllers and cost saving techniques. Quality of power, Power factor and its improvement.	01
7	Transformers, losses in transformers. Energy savings in transformers. Electric motor-selection and application, Energy efficient motors. Variable Speed Drives and Variable Frequency Drives (VFD) and their role in saving electric energy.	02
8	Bureau of Energy Efficiency (BEE): Power saving guide with "Star Ratings" of electrical appliances: Induction Motors, Air conditioners, Refrigerators and Water Heaters. Industrial Lighting: Quality of light, types of light sources, energy efficiency, Light controls.	02
9	Energy efficiency and conservation in utilities: High efficiency boilers, improved combustion techniques for energy conservation, Fluidized Bed Combustion and multi fuel capabilities. Energy conservation in steam distribution systems, efficient piping layouts, protective & insulation coverings in utility pipes.	02
10	Steam conservation opportunities. Upkeep and maintenance of steam auxiliaries and fittings. Conservation and reuse of water, water auditing. Energy conservation opportunities in Wastewater treatment.	02

11	Energy conservation in Refrigeration and AC systems (HVAC), Cooling towers, Pumps and pumping systems, Fans, Blowers, Air compressors. Maintenance and upkeep of Vacuum lines and Compressed air pipe lines.	01
12	Processing equipments: Improving efficiency and energy conservation opportunities in few important food processing operations like Thermal processes, Evaporation, Drying & Freezing. Role of steam traps in energy saving. Energy Savings methods in hot air generator, Thermic fluid heater, Steam radiator.	02
13	Energy conservation in buildings: Concepts of "Green Buildings". Waste-heat recovery and thermal energy storage in food processing facilities. Condensate recovery and reuse. Application of recuparator to recover energy from flue gases from boiler, DG exhaust, hot air from	02
14	Diesel generating sets (stand by AC Gen sets): Energy saving opportunities in DG sets, Fuel and Oil conservation; important regular maintenance aspects. Carbon credits and carbon trade: Concepts of CDM, economic and societal benefits.	02
15	Cleaner energy sources: Introduction to Solar, and Bio-mass Energy; Solar thermal and photo-voltaic energy options for food processing industries. Role of automation in conservation of energy in dairy and food processing: Incorporation of enhanced PLC based computer	02
	Total	24

Practical (DTE -324)

S. No.	Practical to be covered	No. of Classes
1	Study of Energy Conservation Act 2001. Study of schemes of BEE	01
2	Study of concepts of Energy Balance in Unit Operations and System boundaries. Solving examples on energy balances.	02
3	Solving problems on electrical energy use and management: Connected load, Maximum demand, Demand factor and Load curve. Determination of Load factor of an installation.	02
4	Study of use of power factor meter and determination of true. Use of Capacitor and Plant visit.	02
5	Power and wattles power using pf meters, Watt meter, Ammeter and Volt meter.	01
6	Study of performances of a general type of induction motor and an energy efficient induction motor.	01
7	Study of use of VFD and visit to plant for practical.	02
8	Study of various types of electrical appliances classified under different BEE Star Ratings.	01
9	Drawing Energy Balance on a boiler: Collection of data, and Analysis of results. Visit to Boiler plants.	02
10	Study of the boiler and determination of efficiency of boiler	01
11	Exercise on energy audit of Students Experimental Dairy Plant (SGIDT, Patna).	01
	Total	16

Suggested Reading:

1. General Aspects of Energy Management and Energy Audit, Bureau of Energy Efficiency (BEE), 4th Floor, Sewa Bhawan, R.K. Puram, New Delhi- 110066.
2. Energy Efficiency in Electrical Utilities, BEE, New Delhi.
3. Energy Efficiency in Thermal Utilities, BEE, New Delhi.
4. Energy Performance Assessment for equipment and Utility systems
5. Dairy Plant Engineering and Management by Tufail Ahmand,(2012), Kitab Mahal Publisher.
6. Refresher Course for Energy Managers and Energy Auditors by BEE, New Delhi.
7. www.aipnpc.org
8. www.bee-india.nic.in
9. Energy Management by Paul O'Callaghan (1993), McGRAW- HILL Book Company Europe, Shppenhangers Road, England.