GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: POWER ELECTRONICS
SUBJECT NAME: ELECTRICAL ENERGY CONSERVATION AND MANAGEMENT
SUBJECT CODE: 3712917
M.E. 1st SEMESTER

Type of course: Engineering

Prerequisite:

Good fundamental knowledge related to Electrical equipments, Engineering Mathematics. Continuous learning skills related to Energy conservation, plan and conduct a systematic study on Energy management, Billing elements-Electrical Demand and load factor, Power factor etc.

Rationale:

PG Students of Power Electronics Engineering able to apply knowledge of UG discipline to identify, formulate, solve problems and challenges relate to Energy conservation & Management. Students are able to acquire knowledge related to Energy efficiency, Demand side management, Energy Audit, Energy saving etc.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weigh
1	• Electrical Energy Audit: Need for energy management - energy basics Electrical Energy and safety audit-Overview of Electricity Act – Electrical energy audit - Tools for electrical energy audit - Billing elements - Tariff system - Energy and demand charge - Electrical demand and load factor improvement - Power factor correction - Power demand Control - Demand shifting.	**7**	18
2	• Electrical Equipments: Electric motors- motors efficiency, - motor selection – idle running -factors affecting motor performance, efficiency at low load – high efficiency motors - reduce speed/variable drives, load reduction - high-starting torque, rewound motors, motor generator sets, energy efficiency in transformers - Case studies.	**7**	18
3	• Electrical Energy Conservation: Electrical Energy conservation in industrial lighting - control of lighting systems-choice of lighting-Energy saving- Light meter	**10**	24

	audit-methods to reduce costs-summary of different lighting technologies, Input electrical energy requirements in pumps, fans and compressors- Load factor estimation in the equipment- Different types of VFD- Potential of energy conservation- Electrical energy conservation in A/C & refrigeration system- operation and maintenance practices for electrical energy conservation- case examples.		
4	• Energy Efficiency and Demand Side Management • Basic concepts - Importance of demand side managements - - Efficiency gains - Virtues of DSM -Estimation of Energy efficiency potential - Cost effectiveness - Payback period - Barriers for energy efficiency and DSM.	**7**	20
5	• Economic Operation of Industrial DG Sets Advantages, disadvantages and application of DG plants - Maintenance practice - Load matching - PF improvement and parallel operation - Waste heat recovery in industrial DG sets.	**8**	20

Reference Books:

1. Openshaw Taylor E., "Utilisation of Electrical Energy", Orient Longman Ltd, 2003
2. Donald R. Wulfinghoff, "Energy Efficiency Manual", Energy Institute Press, 1999.
3. Tripathy S. C., "Electrical Energy Utilization and Conservation", Tata Mc Graw Hill, 1991.
4. Cyril G. Veinott, Joseph E. Martin, "Fractional & Sub Fractional HP Electric Motor", McGraw Hill
5. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
6. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006

Course Outcome:

After learning the course, the students should be able to:

1. Learn about the means of energy conservation and energy audit.
2. Learn about the concepts of energy efficiency for different electrical equipment.
3. Learn about the concepts behind economic analysis and Load management.
4. Emphasize the energy management on various electrical equipment and metering.
5. Illustrate the concept of lighting systems and cogeneration.

List of Experiments:

Case study related to different topics covered in syllabus can be given to students as laboratory work.

Major Equipment:

PC with required software

List of Open Source Software/learning website:

1. https://www.nptel.ac.in
2. https://www.mathworks.com/
3. https://powersimtech.com
4. https://www.scilab.org/