EEOE4001 ENERGY CONSERVATION & AUDITING (3-0-0)

Course Objectives:
This course provides comprehensive knowledge of energy conservation and auditing techniques, covering energy management principles, industrial audits, electrical system efficiency (motors, HVAC, lighting), power factor improvement, and economic analysis methods (payback, NPV). Students will learn to identify energy-saving opportunities and evaluate conservation projects using practical tools and methodologies.

Module-I: (06 Hrs.)
Basic principles of Energy audit: Energy audit-definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes-Energy audit of industries-energy saving potential, energy audit of process industry, thermal power station, building energy audit

Module-II: (05 Hrs.)
Energy management: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

Module-III: (08 Hrs.)
EB billing: HT and LT supply, transformers, electric motors- motor efficiency computation, energy efficient motors, pumps, fans, blowers, compressed air systems, refrigeration and air conditioning systems, cooling towers, electric heaters (space and liquid), DG-sets, illuminating devices, power factor improvement, and harmonics.

Module-IV: (06 Hrs.)
Power factor improvement, Lighting: Power factor-methods of improvement, location of capacitors, pf with nonlinear loads, effect of harmonics on p.f., p.f. motor controllers-good lighting system design and practice, lighting control, lighting energy audit

Module-V: (05 Hrs.)
Economic aspects and analysis: Economic analysis- Depreciation methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis-Energy efficient motors
Computation of Economic aspects: Calculation of simple payback method, net present worth method-Power factor correction, lighting-Applications of life cycle costing analysis, return on investment.

Course Outcomes:
On completion of this course, students are able to:
CO1: Understand and explain the basic principles, concepts, and methodologies used in energy audits and identify opportunities for energy conservation.
CO2: Apply energy management principles to plan and organize an effective energy management program in an industrial or commercial setup.
CO3: Analyze energy consumption patterns in electrical systems such as motors, pumps, fans, and HVAC systems and suggest efficiency improvements.
CO4: Evaluate power factor correction and lighting systems, and perform energy audits to enhance energy efficiency and quality.
CO5: Perform economic analysis of energy conservation projects using techniques such as payback period, NPV, and life cycle cost analysis.

Text Book(s):

1. Paul o' Callaghan, Energy management, Mcgraw Hill Book company,1998
2. W.R.Murphy and G.McKay, Energy Management, Butterworth Heinemann,1978
3. John C. Andreas, Energy efficient electric motors, Marcel Dekker Inc Ltd,1995
4. S.C.Tripathy, Electric Energy Utilization & Conservation, Tata Mcgraw Hill,1991

Reference Book(s):

1. W.C.Turner, Energy Management Handbook, Fairmont Press,1993
2. Albert Thumann, William J. Younger, Handbook of Energy Audits, Terry Niehus, 2009