M.TECH SECOND SEMESTER

EEPC2T6C **DEMAND SIDE ENERGY MANAGEMENT** **Credits: 4**

(ELECTIVE-IV)

Lecture: 4 periods/week **Internal assessment: 30 marks**

Semester end examination: 70 marks

Objective : The subject delas with energy audit, energy economics, energy conservation in electric utilities and in Industries, electric lighting, energy management program, space heating of buildings, HVAC, cogeneration and energy storage system.

Learning outcomes: After completion of the study

1. Student may be able to understand importance of energy audit and energy index and Sankey diagrams
2. Able to understand the energy economics and cost benefit risk analysis
3. Able to understand energy conservation in electric utilities and in Industries
4. Able to understand construction and technical features of energy efficient electric motors and their efficiency and economics of energy efficient electric motors.
5. Able to understand importance of energy management program and modification and replacement of existing systems and Illumination requirements.
6. Able to understand about various Luminaries, Higher efficiency lamps, white light LED and conducting polymers and energy conservation in lighting
7. Able to understand space heating of building ventilation, Air-conditioning (HVAC), electric water heating systems and energy conservation method
8. Able to understand combined cycle cogeneration and energy storage.

Unit-1 : Energy Audit : Definitions-Need-concepts-Types of energy audit; Energy index – cost index – pie charts – Sankey diagrams.

Unit-2 : Energy Economics: Introduction-Cost benefit risk analysis-Payback period-Straight line depreciation-Sinking fund depreciation—Reducing balance depreciation-Net present value method-Internal rate of return method-Profitability index for benefit cost ratio.

Unit-3 : Energy Conservation in Electric utilities and Industry: Electrical load management: Energy and load management devices-Conservation strategies; conservation in electric utilities and industry: Introduction-Energy conservation in utilities by improving load factor-Utility voltage regulation-Energy conservation in Industries-Power factor improvement.

Unit-4 : Energy–efficient electric motors (EEMs) : Energy efficient motors-construction and technical features-case studies of EEMs with respect to cost effectiveness-performance characteristics; Economics of EEMs and system life cycle-direct savings and payback analysis-efficiency factor or efficiency evaluation factor

Unit-5 : Electric Lighting: Introduction-Need for an energy management program-Building analysis-Modification of existing systems-Replacement of existing systems-priorities:
Illumination requirement : Task lighting requirements-lighting levels-system modifications-non illumination modifications-lighting for non task areas-reflectances-space geometry ;System elements.

Unit-6 : Light sources - characteristics of families of lamps-lamp substitution in existing systems-selection of Higher efficiency lamps for a new system-Luminaries-ballasts-energy conservation in lighting. White light LED and conducting Polymers.

Unit-7 : Space Heating ,Ventilation, Air-Conditioning(HVAC) and Water Heating: Introduction-Heating of buildings-Transfer of Heat-Space heating methods-Ventilation and air-conditioning-Insulation-Cooling load-Electric water heating systems-Energy conservation methods.

Unit-8 : Co-generation and storage: Combined cycle cogeneration-energy storage: pumped hydro schemes-compressed air energy storage(CAES)-storage batteries-superconducting magnetic energy storage (SMES)

References:

1.Energy management Hand book by Wayne C.Turner,John wiley and sons publications
2.Electric Energy Utilization and Conservation by S C Tripathy,Tata McGraw hill publiching company ltd.New Delhi
3.Energy efficient electric motors selection and application by John C.Andreas
4.Hand book on Energy Audit and Management by Amit kumar Tyagi,published by TERI(Tata energy research Institute)
5.Energy management by Paul W.O' Callaghan McGraw hill book company
6.Energy conversion systems by Rakosh Das Begamudre New age international publishers Energy Management – by W.R.Murphy & G.Mckey Butterworths.