ELECTRICAL ENERGY CONSERVATION AND AUDITING

V Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEEC20	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Prerequisite: Fundamentals of Courses like Power Systems, Electrical Machines, etc

I. COURSE OVERVIEW:

This course is aimed to introduce the fundemental topics of Energy conservation and Energy Audit and Management including general philosophy , procedures and techniques, evaluation of saving op- portunities, energy audit report, energy policy planning and implementation, energy balance and MIS and energy audit instruments . This course also covers the concepts of energy efficiency technologies in industrial and in electrical systems.

II. COURSE OBJECTIVES:

The students will try to learn:

I Explain the current energy scenario and importance of energy conservation.

II Understand the concepts of energy management.

III Discuss the methods of improving energy efficiency in different electrical systems.

IV Understand the concepts of different energy efficient devices.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Summarize** the current energy scenario, environmental impact,energysector reforms for policy programmes and implementation of energy conservation activities by the government	Understand
CO 2	**Illustrate the types, methods and instruments** the types, methods and instruments for conducting energy audit.	Understand
CO 3	**Interpret** the impact of power factor improvement, load management, maximum demand control for improving energyefficiency in electrical systems.	Understand
CO 4	**Identify** the energy efficiency of systems used in industries such ascompressed air systems, fans, blowers, pumps and pumping systems	Apply
CO 5	**Make use of** energy efficient technologies in view of energy saving potential in electrical systems	Apply

IV. COURSE SYLLABUS:

MODULE-I: ENERGY SCENARIO (09)

Commercial and Non-commercial energy: Primary energy resources, energy needs of growing economy, long, medium- and short-term energy scenarios, energy pricing, energy sector reforms, energy and environment, energy security, conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change.

MODULE -II: ENERGY MANAGEMENT AND AUDIT (12)

Energy audit: Need, types, approach understanding energy costs, bench marking, maximizing system efficiencies, optimizing the input energy requirements, fuel &energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

MODULE -III: ENERGY EFFICIENCY IN ELECTRICAL SYSTEMS (08)

Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, distribution and transformer losses.

Electric motors: Types, efficiency, factors of performance, rewinding and motor replacement issues.

MODULE -IV: ENERGY EFFICIENCY IN INDUSTRIAL SYSTEMS (08)

Compressed air system, Types of air compressors, efficiency, compressed air system components, energy saving

opportunities in HVAC; Fans and blowers: Types, efficient system operation and energy conservation opportunities; Cooling tower: Types, efficient system operation, flow control strategies and energy saving opportunities.

MODULE -V: ENERGY EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS (08)
Maximum demand controllers, Automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, energy efficient lighting controls.

V. TEXT BOOKS:

1. Anthony J Pansini, Kenneth D Smalling, "Guide to Electric Load Management", Pennwell Publication, 2nd Edition, 1998.
2. E Jordan, "Energy-Efficient Electric Motors and Their Applications", Plenum Publication, corp, 2nd Edition, 1994.

VI. REFERENCE BOOKS:

1. Y P Abbi, and Shashank Jain, "Energy Audit and Environment Management", Hand book on, 2nd Edition 2006.
2. S C Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1st Edition, 1991.
3. Albert Thumann, William J Younger, Terry Niehus, "Hand book of Energy Audits", 2nd Edition, 2009.
4. Giovanni Petrecca, "Industrial Energy Management", "Principles and Applications", The Kluwer international series - 207, 2nd Edition, 1999.

VII. WEB REFERENCES:

1. http://www.rroij.com/open-access/energy-conservation-andaudita-case-study.php?aid=42307
2. http://www.ijsrp.org/research-paper-0813/ijsrp-p2044.pdf
3. https://beeindia.gov.in/sites/default/files/1Ch3.pdf
4. https://www.slideshare.net/rayvarun/energy-conservation-ppt-by-vp-singh
5. http://elion.co.in/elion-energy-audit-conservation

VIII. E-TEXT BOOKS:

1. https://www.amazon.in/ENergy-conservation-audit-b-patil-ebook/ dp/B07 hmvx5yv
2. https://www.worldcat.org/title/energy-management-audit-and-conservation/oclc/891484955