

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Department Elective-II: Electrical Energy Conservation and Audit
Course Code:	1ET1090706
Pre-requisite Course:	Basics of Electrical Power -I

Course Objectives:

1. This subject focuses on the study of Energy Conservation and Audit. It details the students about the current scenario of Renewable as well as Non-renewable energy resources available in the world.
2. It also helps to understand the real time energy management and Energy Auditing in various industries.
3. Students will also come across various financial techniques used for calculation of payback period of energy efficient systems.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	-	-	3	28	70	12	30	-	-	-	-	100

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	Elements of Energy Conservation: Classification of Energy, Indian energy scenario, Sectorial energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long term energy scenario, energy pricing in India, energy security, energy conservation and its importance, energy strategy for the future.	06	15
2	Energy Conservation and Electricity Acts: Energy conservation Act 2001 and its features, notifications under the Act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers, State Designated Agencies, Electricity Act 2003 and its features, Electricity Act 2010 and its features, ECBC code for Building Construction.	08	19
3	Energy Management & Audit: Definition, energy audit, need, types of energy audit. Energy management (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, energy audit instruments and metering.	12	28

4	Financial Analysis Methods: Simple payback period, Return on investment, Net present value, Internal rate of return. Numerical.	07	17
5	Energy Efficiency in Electrical Utilities: Maximum Demand Controllers, Automatic Power Factor Controllers, Energy Efficient Motors, Soft Starters, Energy Efficient Lighting Controls, Energy Efficient Transformers, Electronics ballast.	09	21

Reference Books:

1. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press, 2007.
2. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Inter science publication, 2003.
3. Energy Management: W.R.Murphy, G.Mckay, Butterworths Scientific publication, 2003.
4. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience, 2012.
5. Energy Management Principles, C.B.Smith, Pergamon Press, 2015.

List of Open Source Software/learning website:

- <https://beeindia.gov.in/>
- <http://nptel.ac.in/>
- https://lbre.stanford.edu/sem/energy_conservation
- <https://powermin.nic.in>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To summarized the energy conservation scenario, energy and environment, air pollution, climate change, and various acts and policy for the energy conservation.	2 Understanding
CLO2	To infer the concept of financial management, energy monitoring and targeting.	1 Remembering
CLO3	To apply the knowledge of energy audit for the energy management and operation of energy audit instruments.	3 Applying
CLO4	To analyze the energy saving area and improvement in efficiency of various thermal utilities and systems.	4 Analyzing
CLO5	To evaluate the net present worth in financial management and performance assessment of various thermal utilities and systems.	5 Evaluating
CLO6	Identify and assess the energy conservation / saving opportunities in different electric system.	1 Remembering

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1		H		L	M						L	M		L		
CLO2	L		L	H					M				M		M	
CLO3	M					L				L						L
CLO4		M			L				L	M		H		M		
CLO5				L		H	M						L			
CLO6		L	L	H	M					H	M					M

H: High, M: Medium, L: Low