



SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology



B. Tech.-IV Semester VII	
Subject Name: Energy Management & Audit	Subject Code: BTEL14751

Type of course:	Electrical Engineering
Prerequisite:	Fundamentals of courses like Power Systems, Electrical Machines, Applied Thermal and Hydraulic engineering etc.
Rationale:	This course includes fundamentals of energy management and audit. The energy consumption is increasing day by day due to proliferation of various kinds of loads and industrialization. This gives more stress on bridging energy demand and supply. The generation is not increasing with the rate the demand increases and hence energy conservation is the only option left. It is estimated that approximately the one unit of saving is equivalent of generation of two electrical units. The conservation of energy through proper management is essential because it is about preventing waste of energy and transforming less efficient process/equipment into more energy efficient ones, irrespective of type of facilities, like commercial, industrial or residential as well. The saving of energy has direct influence on cash flows or economics. The energy saving opportunities can only be explored after carrying out its analysis or auditing employing appropriate instruments. All these objectives will be achieved through this course. This course also helps students in preparing for certification of energy manager or energy auditor.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	0	3	60	25	15	0	0	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	General Aspects of Energy Management and Energy Audit: Energy conservation act, 2001, basics of energy, fuels and combustion, need of energy audit and management, definition and objective of energy management, general principles of energy management, energy management skills,	8	16

PEC: Professional Elective Course



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	energy management strategy, material and energy balance, financial management, project management, energy monitoring and targeting, Report-writing, preparations and presentations of energy audit reports, impact of renewable energy on energy audit recommendations, instruments for audit and monitoring energy and energy savings, types and accuracy.		
2.	Energy Efficiency in Electrical Utilities Electrical systems, transformers loss reductions, parallel operations, T & D losses, power factor improvements and automatic power factor controllers, Demand Side management (DSM), Load Management, harmonics & improvements, energy efficient motors and soft starters, variable speed drivers, electronic lighting ballasts, LED lighting. Case Studies related to PF improvement, Electric motors, Drives, Industrial/Commercial Lighting system, etc.	14	31
3.	Energy Efficiency in Thermal Utilities Boilers- performance evaluation, Loss analysis, Water treatment and its impact on boiler losses, integration of different systems in boiler operation. Advances in boiler technologies, FBC and PFBC boilers, Heat recovery Boilers- limitations and constraints. Furnaces- Types and classifications, applications, economics and quality aspects, heat distributions, draft controls, waste heat recovering options, Furnaces refractory- types and sections. Thermic Fluid heaters, need and applications, Heat recovery and its limitations. Insulators- Hot and Cold applications, Economic thickness of insulation, Heat saving and application criteria. Steam Utilization Properties, steam distribution and losses, steam trapping, Condensate, Flash steam recovery.	14	31
4.	Energy Performance Assessment for Equipment and Utility Systems HVAC systems, energy conservation in buildings and ECBC, Pumps, Blowers, Compressors, Cooling towers: types and application, unit's assessment, improvement option, and energy saving opportunities.	9	22

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	15	15	20	20	20

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels (**Revised Bloom's Taxonomy**)

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Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Energy Management	W.R.Murphy, G. Mckay	Butterworths Scientific		
2	Energy Management Principles	C. B. Smith	Pergamon Press		
3	Industrial Energy Conservation	Pergammon Press	D.A. Reay		
4	Energy Management Handbook	John Wiley and Sons, A Wiley Interscience	W.C. Turner		
5	Industrial Energy Management and Utilization	Hemisphere Publication, Washington	L.C. Witte, P.S. Schmidt, D.R. Brown	1988	

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Demonstrate process for energy management and audit.	15
CO-2	Identify instruments for audit and prepare energy audit report	20
CO-3	Identify and evaluate the energy conservation/saving opportunities in different electric system.	25
CO-4	Identify and evaluate energy conservation opportunities in thermal system	25
CO-5	Suggest cost-effective measures towards improving energy efficient and energy conservation.	15



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Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	1	1	1	1	1	2	1	1	1	3	3	1	1		2
CO-2	1	2	2	1	2	1	1	2	1	2	2	2	2	2	1
CO-3	1	2	2	2	2	2	1	2	1	2	2	2	2	1	2
CO-4	1	2	2	2	2	2	1	2	1	2	2	2	2	1	2
CO-5	1	2	2	3	2	3	1	3	1	3	3	2	2	2	3

List of Open Source/learning website:

<https://beeindia.gov.in/>