SARVAJANIK UNIVERSITY
SarvajanikCollege of Engineering and Technology
Bachelor of Technology

B.Tech.-III Semester VI

Subject Name: Energy Management System **Subject Code: BTEL15602**

Type of course: **Open Elective**

Prerequisite: Basic Electrical Engineering, Basic Mechanical Engineering, physics

Rationale: This course includes fundamentals of energy management. 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:** 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, energy management strategy, material and energy balance, financial management, project management, energy monitoring and targeting, Report-writing, instruments for audit and monitoring energy and	08	18

	energy savings, types and accuracy.		
2.	**Energy Economics:** Economic analysis of investments, Present value criterion, Discount rate, simple payback period, return on investment, net present value(NPV), internal rate of return, life cycle costing, energy performance contracts and role of ESCOs, Energy Management Information Systems.	**09**	**20**
3.	**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.	**12**	**27**
4.	**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.	**08**	**18**
5.	**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.	**08**	**17**

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)**

Note: This specification table shall be treated as a general guideline for students andteachers. 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	
6	Guide books for National Certification examination (Book 1 to 4)		Bureau of Energy Efficiency	2015	Fourth

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Demonstrate process for energy management.	**20**
CO-2	Evaluate economical aspects of energy management.	**20**
CO-3	Identify and evaluate the energy conservation/saving opportunities in different electric system.	**30**
CO-4	Identify and evaluate energy conservation opportunities in thermal system	**30**

List of Open Source/learning website:

https://beeindia.gov.in