ENERGY AUDIT AND MANAGEMENT

VI Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEE503	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

COURSE OBJECTIVES:

The course should enable the students to:

I Outline the principles and objectives of energy management.
II Illustrate the techniques, procedures, evaluation and energy audit reporting.
III Devise energy policy planning and implementation.
IV Analyse energy balance sheet and management information System.

COURSE OUTCOMES (COs):

CO 1 Conceptual knowledge of the need and approach of energy audit and management.

CO 2 Capability to integrate various options and assess the business and policy environment regarding energy conservation and energy auditing

CO 3 Advocacy of strategic and policy recommendations on energy conservation and energy auditing

CO 4 Knowledge of energy balance and information management

CO 5 Discuss the instruments required for energy auditing

COURSE LEARNING OUTCOMES (CLOs):

1. Demonstrate knowledge on auditing practices, management measures and economics of energy.
2. Analyze auditing practices, management measures and economics of energy.
3. Design an appropriate energy management measures in commercial and industrial applications.
4. Provide feasible solutions for problems associated with energy auditing and management through proper investigation and interpretation of data.
5. Use appropriate techniques for energy auditing and management.
6. Solve energy auditing and management problems with societal relevance.
7. Consider environment and sustainability in energy auditing and management.
8. Follow relevant rules and regulations in practicing energy audit and management.
9. Communicate effectively on energy audit in written and graphical forms.
10. Consider financial issues in energy audit and management.
11. Devise energy policy planning and implementation.
12. Analyze energy balance sheet and management information System.
13. Know about Instruments for audit and monitoring energy and energy savings, types and accuracy.
14. Knowledge on marketing and communicating training and planning.
15. Explore the knowledge and skills of employability to succeed in national and international level competitive examinations.
16. Apply the concepts of non-renewable and renewable generation, measurements and control in power plants to solve real world applications.
17. Explore the knowledge and skills of employability to succeed in national and international level competitive examinations.

UNIT-I	GENERAL ASPECTS	Classes: 09
General philosophy: Need of energy audit and management, definition and objective of energy management, general principles of energy management, energy management skills, energy management strategy; Energy audit: need, types, methodology and approach, energy management approach, understanding energy costs, bench marking, energy performance, matching energy usage to requirements, maximizing system efficiency, optimizing the input energy requirements, fuel and energy substitution.		
UNIT -II	**PROCEDURES AND TECHNIQUES , EVALUATION OF SAVING OPPORTUNITIES AND ENERGY AUDIT REPORTING**	**Classes: 12**
Data gathering: Level of responsibilities, energy sources, control of energy and uses of energy, facts, figures and impression about energy / fuel and system operations, past and present operating data, special tests, questionnaire for data gathering; Techniques: Incremental cost concept, mass and energy balancing techniques, inventory of energy inputs and rejections; Evaluations: Heat transfer calculations, evaluation of electric load characteristics, process and energy system simulation, determining the savings in Rs, noneconomic factors, conservation opportunities, estimating cost of implementation; Audit report: The plant energy study report, importance, contents, effective organization, report writing and presentation.		
UNIT -III	**ENERGY POLICY PLANNING AND IMPLEMENTATION**	**Classes: 08**
Policy planning: Force field analysis, energy policy purpose, perspective, contents and formulation, location of energy manager, top management support, managerial functions, role and responsibilities of energy manager, accountability. Motivating: Motivation of employees, requirements for energy action planning; Implementation: Designing, barriers, strategies, marketing and communicating training and planning		
UNIT -IV	**ENERGY BALANCE AND MIS**	**Classes: 08**
Energy balance: First law of efficiency and second law of efficiency, facility as an energy system, methods for preparing process flow, materials and energy balance diagram, identification of losses, improvements; MIS: Energy balance sheet and management information system (MIS) energy modeling and optimization.		
UNIT -V	**ENERGY AUDIT INSTRUMENTS**	**Classes: 08**
Instruments: Instruments for audit and monitoring energy and energy savings, types and accuracy.		

Text Books:

1. W R Murphy, G Mckay, “Energy Management”, Butterworths, 2nd Edition, 2009.
2. C B Smith, “Energy Management Principles”, Pergamon Press, 2nd Edition, 1981.
3. I G C Dryden, “Efficient Use of Energy”, Butterworths, 1st Edition, 1982.
4. AV Desai, “Energy Economics” , Wiley Eastern, 1st Edition, 1991.

Reference Books:

1. D A Reay, “Industrial Energy Conservation”, Pergammon Press, 1st Edition, 1977.
2. W C Turner, “ Energy Management Handbook, John Wiley and Sons, 6th Edition , 2006.
3. L C Witte, P S Schmidt, D R Brown, “Industrial Energy Management and Utilization”,.Hemisphere Publication, Washington, 1st Edition, 1988.

Web References:

1. https://www.beeindia.gov.in/content/energy-auditors
2. https://www.cpri.in ›energy efficiency and renewable energy division (ered)
3. https://www.michigan.gov/documents/cis_eo_inside_churchmanual_45636_7.pdf

E-Text Books:

1. https://www.bookstore.teri.res.in/books/9788179930922
2. https://www.sjbit.edu.in/.../eee/.../energy%20auditing%20&%20demand%20side%20