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|--------------------------------|--------------------------------------|----------|----------|----------|----------|
| COURSECODE 1154ME107 | ENERGY CONSERVATION AND AUDIT | L | T | P | C |
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1. Preamble

To enable the students to acquire the knowledge of energy conservation measures in thermal and electrical energy systems. To familiarize the students about energy conservation and energy audit. To familiarize the students with the concept of energy conservation and management.

2. Prerequisite

Basic Electrical Engineering

3. Links to other courses

Project work

4. Course Educational Objectives

Students undergoing this course are expected to:

- Understand the energy management concepts
- Energy conservation principles and measures
- Learn the methods of energy audit and usage of instruments
- Analyse and report the outcome of energy audit

5. Course Outcomes

Upon the successful completion of this course, the learners will be able to

| CO Nos. | Course Outcomes | Level of learning domain (Based on revised Bloom's) |
|----------------|--|--|
| CO1 | Identify the energy demand supply gap in the World & India and understand energy conservation opportunities available | K2 |
| CO2 | Quantify the energy conservation opportunities in different thermal systems | K3 |
| CO3 | Quantify the energy conservation opportunities in different electrical systems | K3 |
| CO4 | Identify and evaluate the common energy conservation opportunities in different energy intensive industrial equipments | K3 |
| CO5 | Understand the need for energy audit and examine the economic evaluation of energy conservation solutions adopted | K3 |

(K3 – APPLY)

6. Correlation of Course Outcomes with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | M | | | | | L | L | | | | L | L | L | |
| CO2 | M | | | | | L | L | | | | L | L | L | |
| CO3 | M | | | | | L | L | | | | L | L | L | |
| CO4 | M | | | | | L | L | | | | L | L | L | |
| CO5 | M | | | | | L | L | | | | L | L | L | |

H-High; M-Medium; L-Low

7. Course Content

UNIT I INTRODUCTION TO ENERGY CONSERVATION

L- 9

Principles - Past and present energy scenario of world – Energy consumption in India – resource availability – Demand supply gap - Environmental aspects–Energy Conservation act – Standards and labeling – designated consumers

UNIT II ENERGY CONSERVATION IN THERMAL SYSTEMS

L- 9

Steam systems – Boilers - blow down control – furnaces – thermic fluid heaters – steam traps – insulators and refractories –cooling tower – air pressure control – waste heat recovery – cogeneration

UNIT III ENERGY CONSERVATION IN ELECTRICAL SYSTEMS

L- 9

Components of EB billing - types of tariff – HT and LT supply – Transformers – cable selection – power factor improvement – capacitors – harmonics – electric motors – efficiency – energy efficient motors – variable speed drives - lighting – types- efficacy – LED

UNIT IV ENERGY CONSERVATION IN INDUSTRIES

L- 9

Pumps – fans – blowers – compressed air systems – refrigeration and air conditioning systems – cooling towers – DG sets

UNIT V ENERGY AUDIT AND ENERGY ECONOMICS

L-9

Energy audit -need – types - benefits - methodology and barriers – role of energy managers – instruments for energy auditing; Energy economics – discount rate – depreciation cost - payback period – internal rate of return – net present value – life cycle costing – case study.

TOTAL: 45 Periods

8. Text Books

1. Kennedy, William J., Turner, Wayne C., &Capehart, Barney L., Guide to Energy Management, The Fairmount Press
2. Callaghan, P.W., Design and Management for Energy Conservation”, Pergamon Press, Oxford

9. References

1. Dryden, I.G.C., The Efficient Use of Energy, Butterworths, London
2. Turner, W.C., Energy Management Handbook, Wiley, New York (1982)
3. Energy Manager Training Manual (www.energymanagertraining.com)