

1.0 Course Content

General Aspects of Energy Efficiency and Management: Energy Scenario; Laws of thermodynamics: concept of energy conservation and energy efficiency; concept of energy management programme; basic components of energy audit; Energy economics; Energy and Heat balance; Sankey Diagram; Energy Action Planning; Project Management.

Thermal Utilities: Fuels and Combustion: excess air control; Boilers-Steam distribution & utilization; Insulation & Refractories

Electrical Utilities: Electrical systems: demand control power factor correction; Electrical motors; Compressed air system; HVAC and Refrigeration System; Fans & Blowers; Pumps and Pumping System; Energy Conservation in Buildings and ECBC; energy conservation in Lighting System.

Energy Performance Assessment for Equipment and Utility Systems: Cogeneration; Waste Heat Recovery: recuperators, heat wheels, heat pipes, heat pumps; Heat exchanger networking- concept of pinch, target setting, problem table approach, composite curves. Global Environmental Concerns: Benchmarking Energy Performance and Carbon Footprint, Energy and Climate Change and CDM, Energy conservation policy.

2.0 Text Book

- [1] T.C. Kandpal and H.P. Garg, Financial Evaluation of Renewable Energy Technologies, MacMillan Indian LTD. (ISBN – 13: 9781403909527), 2003.
- [2] Barun Kumar De, Energy Management, Audit and Conservation, Vrinda Publications Private LTD-Delhi, 2014 2nd Edition, (ISBN: 9788182813434, 8182813433)

3.0 Reference Book

- [3] Doty S. and Turner W. C. (2012); *Energy Management Handbook*, Eighth Edition, Fairmont Press
- [4] Kreith F. and West R. E. (1996); *Handbook of Energy Efficiency*, First Edition, CRC Press
- [5] Thumann A. and Mehta D. P. (2001); *Handbook of Energy Engineering*, Sixth Edition, Fairmont Press
- [6] Capehart B. L. Turner W. C. and Kennedy W. J. (2011); *Guide to Energy Management*, Seventh Edition. Fairmont Press
- [7] Bureau of Energy Efficiency (BEE) (2012); Study material for Energy Managers and Auditors Examination: Paper I to IV
- [8] Thumann A. Niehus T. and Younger W. J. (2012); *Handbook of Energy Audits*, Ninth Edition, CRC Press
- [9] I.G.C.Dryden, Butterworths, The Efficient Use of Energy, London, 1982
- [10] W.C.Turner, Wiley, Energy Management Handbook, New York, 1982.

4.0 Preamble

Basic knowledge of energy conservation, energy efficiency and energy management is of utmost importance in order to design energy efficient systems/methods or processes in the domain of energy science and engineering. The knowledge will also be useful to decide how efficiently a single task can be performed with minimum energy consumption at minimum investment. The course content is designed to provide the concepts of energy efficiency, and different schemes of energy management and auditing.

Concepts will be illustrated with schematics and block diagrams wherever required. Sufficient number of numerical examples with solutions will be discussed in the course. This course is specifically designed for post graduate students of Energy Engineering. Further, the course will be very much useful for students and researchers from varied academic backgrounds for synthesis of novel energy conversion devices and processes.